Form: PTO/SB/17 (Modified)

REPLY/AMENDMENT FEE TRANSMITTAL

Attorney Docket No.	911322US
Application Number	09/008,947
Filing Date	1/20/1998
First Named Inventor	Mills
Group Art Unit	1745
Examiner Name	Kalafut

AMOUNT ENCLOSED $475

(stamp: OIPE JC139 JAN 0 7 2004 PATENT & TRADEMARK OFFICE)

(stamp: RECEIVED JAN 13 2004 TC 1700)

FEE CALCULATION (fees effective 10/01/97)

CLAIMS AS AMENDED	Claims Remaining After Amendment	Highest Number Previously Paid For	Number Extra		Rate	Calculations
TOTAL CLAIMS	68	68	0	X	$18.00 =	
INDEPENDENT CLAIMS	19	19	0	X	$78.00 =	

Since an Official Action set an <u>original</u> due date of <u>October 7, 2003</u>, petition is hereby made for an extension to cover the date this reply is filed for which the requisite fee is enclosed (1 month ($110); 2 months ($400); 3 months ($950); 4 months ($1,510); 5 months ($2,060)): 3 Months		950
Multiple Dependent Claims Fee		
Total of above Calculations =		$950
Reduction by 50% for filing by small entity (37 CFR 1.9, 1.27 & 1.28)		-475
TOTAL FEES DUE =		$475

(1) If entry (1) is less than entry (2), entry (3) is "0".
(2) If entry (2) is less than 20, change entry (2) to "20".
(4) If entry (4) is less than entry (5), entry (6) is "0".
(5) If entry (5) is less than 3, change entry (5) to "3".

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METHOD OF PAYMENT

[x]   Check enclosed as payment.

[ ]   Charge "TOTAL FEES DUE" to the Deposit Account No., below.

AUTHORIZATION

[X]   If the above-noted "AMOUNT ENCLOSED" is not correct, the Commissioner is hereby authorized to credit any overpayment or charge any additional fees under 37 CFR 1.16 or 1.17 necessary to maintain pendency of the present application to:

Deposit Account No.:	50-0687
OrderNo.: (Client/Matter)	62-226

SUBMITTED BY: Manelli, Denison & Selter, PLLC,   Customer No.: 20736

Typed Name	Jeffrey S. Melcher	Reg. No.	35,950
Signature	*(signature)*	Date	January 7, 2004
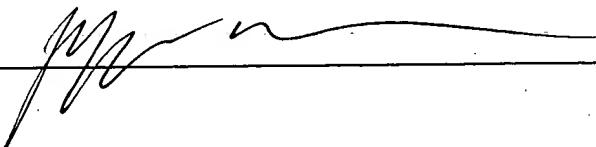
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re <u>PATENT APPLICATION</u> of
Inventor(s): Mills

App'n Ser. No.: 09/008,947

Filing Date: 01/20/1998

Title: HYDRIDE BATTERY AND FUEL CELL

Group Art Unit: 1745

Examiner(s): Kalafut *for*
the Secret Committee

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TC 1700

January 7, 2004

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RESPONSE TO OFFICE ACTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant files this Response to the Office Action mailed July 7, 2003.

Reconsideration and allowance of the subject application are respectfully requested.

Claims 1, 2, 4-6 and 10-59 are pending in the application.

The rejection of claims 1, 2, 4-6 and 10-59 under 35 U.S.C. § 101 as being inoperative and lacking utility is respectfully traversed. Applicant respectfully submits that the anonymous group of PTO officials, i.e., the "Secret Committee," who is directing the named Examiner's actions in this case has not met its burden to provide a prima facie case of inoperability for the many reasons of record and, therefore, the rejection should be withdrawn for those reasons alone. Furthermore, Applicant has disclosed substantial experimental evidence in the present disclosure, prior submissions and submissions herewith that fully rebut any prima facie case of inoperability the Examiner might have raised. Applicant responds more fully to the Secret Committee's comments, discusses the experimental evidence of record, and summarizes the improper prosecution procedures used by the Committee in the following paragraphs. For these many reasons, the Section 101 rejection should be withdrawn.

The related rejection of claims 1, 2, 4-6 and 10-59 under 35 U.S.C. § 112, first paragraph, as lacking enablement, is also respectfully traversed. Applicant respectfully submits that the Secret Committee has not met its burden to provide a prima facie case of lack of enablement for the many reasons of record and, therefore, the rejection should be withdrawn for those reasons alone. Furthermore, Applicant has disclosed substantial experimental evidence in the present disclosure, prior submissions and submissions herewith that fully rebut any prima facie case of lack of enablement the Examiner might have raised. Applicant responds more fully to the Committee's comments, discusses the experimental evidence of record, and summarizes the improper prosecution procedures used by the Committee in the following paragraphs. For these many reasons, the Section 112, first paragraph, rejection should be withdrawn.

Submitted with this Response is new, non-cumulative scientific evidence further demonstrating the existence of lower energy states of hydrogen in many different ways, including, but not limited to, studies of spectroscopic lines, energy output, compositions of matter, generated plasmas, and inverted hydrogen populations. Applicant also identifies the independent third-party data pursuant to the PTO's agreement, which evidence resulted in verbal confirmation of allowability of two copending BlackLight applications handled by Examiner Langel before he was forced to resign from the cases "for moral and ethical reasons," as explained below.

Applicant respectfully demands that the Secret Committee consider and evaluate in detail this and all other evidence of record so far ignored and, to the extent that it finds fault with any of the scientific data, that those findings be communicated to provide Applicant a full opportunity to respond.

Applicant also files herewith a Rule 132 Declaration certifying the newly submitted experimental evidence, which further rebuts the Secret Committee's unjustified utility and enablement rejections of the claimed invention. This evidence, which appears in 90-plus articles submitted to various scientific journals for publication,

conclusively confirms the formation of lower-energy hydrogen through practice of Applicant's novel hydrogen chemistry.

With this latest submission, Applicant now has over 90 articles and books of record in this case, as reflected in the "List of References" set forth below. The articles and books numbered 1-85 were already made of record in previous submissions, but are being referred to in this paper using new numbers as set forth below.

These articles detail studies that experimentally confirm a novel reaction of atomic hydrogen which produces hydrogen in fractional quantum states that are at lower energies than the traditional "ground" ($n = 1$) state, a chemically generated or assisted plasma (rt-plasma), and novel hydride compounds, including:

extreme ultraviolet (EUV) spectroscopy[1],

characteristic emission from catalysis and the hydride ion products[2],

lower-energy hydrogen emission[3],

plasma formation[4],

Balmer α line broadening[5],

population inversion of hydrogen lines[6],

elevated electron temperature[7],

anomalous plasma afterglow duration[8],

power generation[9], excessive light emission[10], and

analysis of chemical compounds[11].

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[1] Reference Nos. 11-16, 20, 24, 27-29, 31-36, 39, 42-43, 46-47, 50-52, 54-55, 57, 59, 63, 65-68, 70-76, 78-79, 81, 83, 85, 86, 89, 91-93, 95-96, and 98.

[2] Reference Nos. 24, 27, 32, 39, 42, 46, 51-52, 55, 57, 68, 72-73, 81, 89, and 91.

[3] Reference Nos. 14, 28-29, 33-36, 50, 63, 67, 70-71, 73, 75-76, 78-79, 86-87, 90, 92, 93, 98

[4] Reference Nos. 11-13, 15-16, 20, 24, 27, 32, 39, 42, 46-47, 51-52, 54-55, 57, 72, 81, 89, 91-93

[5] Reference Nos. 16, 20, 30, 33-37, 39, 42-43, 49, 51-52, 54-55, 57, 63-65, 68-69, 71-74, 81-85, 88-89, 91, 92, 93, 95-97

[6] Reference Nos. 39, 46, 51, 54, 55, 57, 59, 65-66, 68, 74, 83, 85, 89, 91

[7] Reference Nos. 34-37, 43, 49, 63, 67, 73

[8] Reference Nos. 12-13, 47, 81

[9] Reference Nos. 30-31, 33, 35-36, 39, 43, 50, 63, 71-73, 76-77, 81, 84, 89, 92, 93, 98

[10] Reference Nos. 11, 16, 20, 23, 31, 37, 43, 52, 72

[11] Reference Nos. 6-10, 19, 25, 38, 41, 44-45, 60-62, 64, 69, 75, 81-82, 87-88, 90, 92, 93, 94, 98, 100

Exemplary studies include:

1.) the observation of intense extreme ultraviolet (EUV) emission at low temperatures (e.g. $\approx 10^3\ K$) from atomic hydrogen and only those atomized elements or gaseous ions which provide a net enthalpy of reaction of approximately $m \cdot 27.2\ eV$ via the ionization of t electrons to a continuum energy level where t and m are each an integer (e.g. K and Cs atoms and Rb^+ and Sr^+ ions ionize at integer multiples of the potential energy of atomic hydrogen and caused emission; whereas, the chemically similar atoms, Na, Mg, and Ba, do not ionize at integer multiples of the potential energy of atomic hydrogen and caused no emission)[12],

2.) the observation of novel EUV emission lines from microwave and glow discharges of helium with 2% hydrogen with energies of $q \cdot 13.6\ eV$ where $q = 1,2,3,4,6,7,8,9,11,12$ or these lines inelastically scattered by helium atoms in the excitation of $He\,(1s^2)$ to $He\,(1s^1 2p^1)$ that were identified as hydrogen transitions to electronic energy levels below the "ground" state corresponding to fractional quantum numbers[13],

3.) the observation of novel EUV emission lines from microwave and glow discharges of helium with 2% hydrogen at 44.2 nm and 40.5 nm with energies of $q \cdot 13.6 + \left(\dfrac{1}{n_f^2} - \dfrac{1}{n_i^2} \right) X 13.6\ eV$ where $q = 2$ and $n_f = 2,4$ $n_i = \infty$ that corresponded to multipole coupling to give two-photon emission from a continuum excited state atom and an atom undergoing fractional Rydberg state transition[14],

4.) the identification of transitions of atomic hydrogen to lower energy levels corresponding to lower-energy hydrogen atoms in the extreme ultraviolet emission spectrum from interstellar medium and the sun[15],

[12] Reference Nos. 11-13, 15-16, 20, 24, 27, 32, 39, 42, 46-47, 51-52, 54-55, 57, 72, 81, 89, 91-93
[13] Reference Nos. 28, 33-36, 50, 63, 67, 71, 73, 75-76, 78, 86-87, 90, 92, 93
[14] Reference Nos. 36, 71, 73
[15] Reference Nos. 1, 5, 17, 28-29

5.) the observation that the novel EUV series of lines with energies of $q \cdot 13.6 \, eV$ was observed with an Evenson microwave cell, only a the peak corresponding to $q = 2$ was observed with an RF cell, and none of the peaks were observed with a glow discharge cell[16],

6.) the observation that in a comparison of Evenson, McCarroll, cylindrical, and Beenakker microwave cavity plasmas, the novel EUV series of lines with energies of $q \cdot 13.6 \, eV$ was only observed for Evenson-cavity helium-hydrogen plasmas[17],

7.) the EUV spectroscopic observation of lines for a hydrogen-K catalyst plasma by the Institut für Niedertemperatur-Plasmaphysik e.V. that could be assigned to transitions of atomic hydrogen to lower energy levels corresponding to fractional principal quantum numbers and the emission from the excitation of the corresponding hydride ions[18],

8.) the recent analysis of mobility and spectroscopy data of individual electrons in liquid helium which shows direct experimental confirmation that electrons may have fractional principal quantum energy levels[19],

9.) the observation of novel EUV emission lines from microwave discharges of argon or helium with 10% hydrogen that matched those predicted for the reaction $H(1/4) + H^+ \rightarrow H_2(1/4)^+$ having an energy spacing of 2^2 times the transition-state vibrational energy of H_2^+ with the series ending on the bond energy of $H_2(1/4)^{+}$ [20],

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[16] Reference Nos. 71, 73
[17] Reference No. 76
[18] Reference No. 14
[19] eference Nos. 17, 53
[20] Reference Nos. 29, 70, 73, 79, 92, 93, 98

10.) the result that the novel vibrational series for the reaction $H(1/4) + H^+ \rightarrow H_2(1/4)^+$ was only observed for catalyst plasmas of helium, neon, and argon mixed with hydrogen, but not with noncatalyst xenon or krypton mixed plasmas[21],

11.) the observation that based on the intensities of the peaks, the catalyst and the plasma source dependence of the reaction rate to form $H_2(1/4)^+$ is $Ar^+ > He^+ > Ne^+$ and microwave > glow discharge >> RF, respectively[22],

12.) the observation that the microwave plasma source dependence of the reaction rate to form $H_2(1/4)^+$ is Evenson microwave > McCarroll, cylindrical, Beenakker[23],

13.) the observation of rotational lines in the 145-300 nm region from atmospheric pressure 15 keV electron-beam excited argon-hydrogen plasmas where the unprecedented energy spacing of 4^2 times that of hydrogen established the internuclear distance as 1/4 that of H_2 and identified $H_2(1/4)^{24}$,

14.) the observation of a series of vibration-rotational bands in the 60-67 nm region, a high-energy region for which vibration-rotational spectra are ordinarily unknown, emitted from low-pressure helium-hydrogen (99/1%) microwave plasmas that matched the predicted energy spacing of the vibrational energy of H_2 about the bond energy of $H_2(1/2)$ corresponding to the reaction $2H(1/2) \rightarrow H_2(1/2)^{25}$,

15.) the observation of EUV plasma emission spectra in the region 60 nm to 100 nm that matched the predicted emission lines $E_{D\,H_2}$ due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\dfrac{\upsilon*}{3}\right) 0.515902\ eV$ to longer wavelengths for $\upsilon* = 2$ to $\upsilon* = 32$ and to

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[21] Reference Nos. 29, 70, 73, 79, 92, 93
[22] Reference No. 70
[23] Reference No. 79
[24] Reference No. 98
[25] Reference No. 99

shorter wavelengths for $\upsilon* = 1$ to $\upsilon* = 16$ to within the spectrometer resolution of about $\pm 0.05\%$[26],

16.) the observation that in addition to members of the series of novel emission lines with energies of $q \cdot 13.6 \, eV$ or $E_{D+vib} = 17.913 \pm \left(\dfrac{\upsilon*}{3}\right) 0.515902 \, eV$ an additional intense peak was observed from a scaled-up Evenson cell at $41.6 \, nm$ with an energy of $29.81 \, eV$ that matched $q \cdot 13.6 \, eV$ with $q = 4$ less $24.58741 \, eV$ corresponding to inelastic scattering of these photons by helium atoms due to ionization of He to He^{+}[27],

17.) the observation that in a comparison of Evenson, McCarroll, cylindrical, and Beenakker microwave cavity plasmas, the novel series of spectral lines due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\dfrac{\upsilon*}{3}\right) 0.515902 \, eV$ was only observed for Evenson-cavity helium-hydrogen and neon-hydrogen plasmas[28],

18.) the observation by gas chromatography that hydrogen was consumed by the helium-hydrogen plasmas which showed the novel EUV series of lines with energies of $q \cdot 13.6 \, eV$, the novel series of spectral lines due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\dfrac{\upsilon*}{3}\right) 0.515902 \, eV$, extraordinary H Balmer line broadening corresponding to $180 - 210 \, eV$, and excess power of 21.9 W in 3 cm^3[29],

19.) the observation of the dominant He^{+} emission and an intensification of the plasma emission observed when He^{+} was present with atomic hydrogen demonstrated the role of He^{+} as a catalyst[30],

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[26] Reference Nos. 50, 75-76, 78, 86-87, 90, 92, 93
[27] Reference No. 86
[28] Reference No. 76
[29] Reference No. 76
[30] Reference Nos. 36, 73

20.) the observation of continuum state emission of Cs^{2+} and Ar^{2+} at $53.3\ nm$ and $45.6\ nm$, respectively, with the absence of the other corresponding Rydberg series of lines from these species which confirmed the resonant nonradiative energy transfer of $27.2\ eV$ from atomic hydrogen to the either Cs or Ar^+ catalyst[31],

21.) the spectroscopic observation of the predicted hydride ion $H^-(1/2)$ of hydrogen catalysis by either Cs or Ar^+ catalyst at $407\ nm$ corresponding to its predicted binding energy of $3.05\ eV$[32],

22.) the observation of characteristic emission from K^{3+} which confirmed the resonant nonradiative energy transfer of $3 \cdot 27.2\ eV$ from atomic hydrogen to atomic K[33],

23.) the spectroscopic observation of the predicted $H^-(1/4)$ ion of hydrogen catalysis by K catalyst at $110\ nm$ corresponding to its predicted binding energy of $11.2\ eV$[34],

24.) the observation of characteristic emission from Rb^{2+} which confirmed the resonant nonradiative energy transfer of $27.2\ eV$ from atomic hydrogen to Rb^+[35],

25.) the spectroscopic observation of the predicted $H^-(1/2)$ ion of hydrogen catalysis by Rb^+ catalyst at $407\ nm$ corresponding to its predicted binding energy of $3.05\ eV$[36],

26.) the observation of $H^-(1/2)$, the hydride ion catalyst product of K^+ / K^+ or Rb^+, at its predicted binding energy of $3.0468\ eV$ by high resolution visible spectroscopy as a continuum threshold at 4068.2 Å and a series of structured peaks separated from

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[31] Reference Nos. 24, 39, 51, 54-55, 57, 91
[32] Reference No. 24
[33] Reference Nos. 27, 39, 42, 46, 51, 54-55, 57, 81, 89, 91
[34] Reference Nos. 81, 42, 27
[35] Reference Nos. 32, 39, 42, 46, 51, 54-55, 57, 81, 89, 91
[36] Reference No. 32

the binding energy by an integer multiple of the fine structure of $H(1/2)$ starting at 4071 Å that matched predicted free-free transitions[37],

27.) the observation that the high resolution visible K^+/K^+ or $Rb^+ - H_2$ plasma emission spectra in the region of 3995 to 4060 Å matched the predicted bound-free hyperfine structure lines E_{HF} of $H^-(1/2)$ calculated from the electron g factor as $E_{HF} = j^2 3.00213 \, X \, 10^{-5} + 3.0563 \, eV$ (j is an integer) for $j = 1$ to $j = 39$ (3.0563 eV to 3.1012 eV—the hydride binding energy peak plus one and five times the spin-pairing energy, respectively) to within a 1 part per 10^4[38],

28.) Rb^+ or $2K^+$ catalysts formed a plasma having strong VUV emission with a stationary inverted Lyman population with an overpopulation sufficient for lasing, and emission from $H^-(1/2)$ was observed at 4071 Å corresponding to its predicted binding energy of $3.0468 \, eV$ with the fine structure and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213 \, X \, 10^{-5} + 3.0563 \, eV$ (j is an integer) that matched for $j = 1$ to $j = 37$ to within a 1 part per 10^4[39],

29.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing at wavelengths over a wide range from micron to blue wherein molecular oxygen served as the catalyst as supported by O^{2+} emission and H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone[40],

30.) the observation of H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone at distances up to 5 cm from the coupler[41],

31.) the observation that with a microwave input power of $9 \, W \cdot cm^{-3}$, a collisional radiative model showed that the hydrogen excited state population distribution was

[37] Reference Nos. 39, 42, 46, 57, 81, 89, 91
[38] Reference Nos. 39, 42, 46, 57, 81, 89, 91
[39] Reference Nos. 39, 42, 46, 51, 54, 55, 57, 81, 89, 91
[40] Reference Nos. 59, 65-66, 68, 74, 83, 85
[41] Reference No. 74

consistent with an $n = 1 \rightarrow 5,6$ pumping power of an unprecedented $200 \; W \cdot cm^{-3}$ permissive of gas laser efficiencies orders of magnitude those of conventional visible gas lasers and direct generation of electrical power using photovoltaic conversion of the spontaneous or stimulated water vapor plasma emission[42];

32.) the observation of stimulation of the stationary inverted H Balmer population from a low pressure water-vapor microwave discharge plasma by back illumination with an infrared source that showed depopulation of the $n = 5$ state[43],

33.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation · sufficient for lasing was observed for Evenson microwave plasmas, but not for RF or discharge plasmas[44],

34.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing that was dependent on the microwave plasma source with the highest inversion from Evenson microwave plasmas[45],

35.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing that was dependent on the pressure of the Evenson microwave plasma[46],

36.) the observation of stationary inverted H Balmer populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing at distances up to 5 cm from the coupler[47],

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[42] Reference Nos. 68, 83, 85
[43] Reference Nos. 59, 65, 68, 85
[44] Reference Nos. 59, 65-66, 68, 73, 83, 85
[45] Reference No. 83
[46] Reference Nos. 59, 68, 73, 83, 85
[47] Reference No. 74

37.) the observation that the requirement for the natural hydrogen-oxygen stoichiometry of the Evenson water plasma was stringent in that a deviation by over 2% excess of either gas caused a reversal of the H inversion in water vapor plasmas[48],

38.) the observation of a typical slow H population for a water-vapor plasma maintained in a GEC-type cell that was independent of time, and a new phenomenon, an extraordinary fast population that increased from zero to a significant portion of the Balmer α emission with time under no-flow conditions wherein the peak width and energy increased with time up to a 0.7 nm half-width corresponding to an average hydrogen atom energy of 200 eV[49],

39.) the observation of a substantial fast H population (~20% at 40 eV) for a water-vapor plasmas maintained in a GEC-type cell that was independent of position including regions were the electric field was orders of magnitude to low to explain the extraordinarily high Doppler energies[50],

40.) the observation of fast H population (40-50 eV) for a He/H_2 (95/5%) as well as Ar/H_2 (95/5%) plasmas maintained in a GEC-type cell that was independent of position including regions were the electric field was orders of magnitude to low to explain the extraordinarily high Doppler energies[51],

41.) the observation by the Institut für Niedertemperatur-Plasmaphysik e.V. of an anomalous plasma and plasma afterglow duration formed with hydrogen-potassium mixtures[52],

42.) the observation of anomalous afterglow durations of plasmas formed by catalysts providing a net enthalpy of reaction within thermal energies of $m \cdot 27.28 \, eV$[53],

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[48] Reference Nos. 59, 68, 83, 85
[49] Reference No. 95
[50] Reference No. 96
[51] Reference No. 97
[52] Reference Nos. 13, 47, 81

43.) the formation of a chemically generated hydrogen plasma with the observation of Lyman series in the EUV that represents an energy release about 10 times that of hydrogen combustion which is greater than that of any possible known chemical reaction[54],

44.) the observation of line emission by the Institut für Niedertemperatur-Plasmaphysik e.V. with a 4° grazing incidence EUV spectrometer that was 100 times more energetic than the combustion of hydrogen[55],

45.) the excessive increase in the Lyman emission upon the addition of helium or argon catalyst to a hydrogen plasma[56],

46.) the observation of the characteristic emission from Sr^+ and Sr^{3+} that confirmed the resonant nonradiative energy transfer of $2 \cdot 27.2 \, eV$ from atomic hydrogen to Sr^{+}[57],

47.) the observation of anomalous plasmas formed with Sr and Ar^+ catalysts at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source[58],

48.) the observation that the optically measured output power of gas cells for power supplied to the glow discharge increased by over two orders of magnitude depending on the presence of less than 1% partial pressure of certain catalysts in hydrogen gas or argon-hydrogen gas mixtures, and an excess thermal balance of 42 W

[53] Reference Nos. 12, 13, 47, 81
[54] Reference Nos. 11-13, 15-16, 20, 24, 27, 32, 39, 42, 46-47, 51-52, 54-55, 57, 72, 81, 89, 91
[55] Reference No. 14
[56] Reference Nos. 20, 31, 37, 43
[57] Reference Nos. 16, 52
[58] Reference Nos. 11, 16, 20, 23, 52, 72

was measured for the 97% argon and 3% hydrogen mixture versus argon plasma alone[59],

49.) the observation that glow discharge plasmas of the catalyst-hydrogen mixtures of strontium-hydrogen, helium-hydrogen, argon-hydrogen, strontium-helium-hydrogen, and strontium-argon-hydrogen showed significant Balmer α line broadening corresponding to an average hydrogen atom temperature of 25 - 45 eV; whereas, plasmas of the noncatalyst-hydrogen mixtures of pure hydrogen, krypton-hydrogen, xenon-hydrogen, and magnesium-hydrogen showed no excessive broadening corresponding to an average hydrogen atom temperature of ≈ 3 eV[60],

50.) the observation that microwave helium-hydrogen and argon-hydrogen plasmas having catalyst Ar^+ or He^+ showed extraordinary Balmer α line broadening due to hydrogen catalysis corresponding to an average hydrogen atom temperature of 110 - 130 eV and 180 - 210 eV, respectively; whereas, plasmas of pure hydrogen, neon-hydrogen, krypton-hydrogen, and xenon-hydrogen showed no excessive broadening corresponding to an average hydrogen atom temperature of ≈ 3 eV[61],

51.) the observation that microwave helium-hydrogen and argon-hydrogen plasmas showed average electron temperatures that were high, $30,500 \pm 5\%$ K and $13,700 \pm 5\%$ K, respectively; whereas, the corresponding temperatures of helium and argon alone were only $7400 \pm 5\%$ K and $5700 \pm 5\%$ K, respectively[62],

52.) the observation of significant Balmer α line broadening of 17, 9, 11, 14, and 24 eV from rt-plasmas of incandescently heated hydrogen with K^+/K^+, Rb^+, cesium, strontium, and strontium with Ar^+ catalysts, respectively, wherein the results could not be explained by Stark or thermal broadening or electric field

[59] Reference No. 22
[60] Reference Nos. 16, 20, 30, 52, 72
[61] Reference Nos. 33-37, 43, 49, 60, 63-64, 69, 71, 73-74, 82, 84, 88, 92, 93
[62] Reference Nos. 34-37, 43, 49, 63, 67, 73

acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm, corresponding to a broadening of much less than 1 eV[63],

53.) calorimetric measurement of excess power of 20 mW/cc on rt-plasmas formed by heating hydrogen with K^+ / K^+ and Ar^+ as catalysts[64],

54.) the observation of rt-plasmas formed with strontium and argon at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source as well as an excess power of 20 mW/cm from rt-plasmas formed by Ar^+ as the catalyst in an incandescent-filament cell[65],

55.) the Calvet calorimetry measurement of an energy balance of over $-151,000 \ kJ/mole \ H_2$ with the addition of 3% hydrogen to a plasma of argon having the catalyst Ar^+ compared to the enthalpy of combustion of hydrogen of $-241.8 \ kJ/mole \ H_2$; whereas, under identical conditions no change in the Calvet voltage was observed when hydrogen was added to a plasma of noncatalyst xenon[66],

56.) the observation that the power output exceeded the power supplied to hydrogen glow discharge plasmas by 35-184 W depending on the presence of catalysts from helium or argon and less than 1% partial pressure of strontium metal in noble gas-hydrogen mixtures; whereas, the chemically similar noncatalyst krypton had no effect on the power balance[67],

57.) the observation that with the addition of 3% flowing hydrogen to an argon microwave plasma with a constant input power of 40 W, the gas temperature increased

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[63] Reference Nos. 39, 42, 46, 51-52, 54-55, 57, 72, 81, 89, 91
[64] Reference Nos. 39, 81, 89
[65] Reference No. 72
[66] Reference No. 31
[67] Reference No. 30

from 400°C to over 750°C; whereas, the 400°C temperature of a xenon plasma run under identical conditions was essentially unchanged with the addition of hydrogen[68],

58.) observations of power such as that where the addition of 10% hydrogen to a helium microwave plasma maintained with a constant microwave input power of 40 W, the thermal output power was measured to be at least 280 W corresponding to a reactor temperature rise from room temperature to 1200°C within 150 seconds, a power density of 28 MW/m^3, and an energy balance of at least $-4 \, X10^5 \, kJ/mole \, H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \, kJ/mole \, H_2$[69],

59.) the observation of $306 \pm 5 \, W$ of excess power generated in 45 cm^3 by a compound-hollow-cathode-glow discharge of a neon-hydrogen (99.5/0.5%) mixture corresponding to a power density of 6.8 MW/m^3 and an energy balance of at least $-1 \, X10^6 \, kJ/mole \, H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \, kJ/mole \, H_2$[70],

60.) the observation that for an input of 37.7 W, the total plasma power of the neon-hydrogen plasma measured by water bath calorimetry was 60.7 W corresponding to 23.0 W of excess power in 3 cm^3[71],

61.) the observation of intense He^+ emission and a total plasma power of a helium-hydrogen plasma measured by water bath calorimetry of 30.0 W for an input of 8.1 W, corresponding to 21.9 W of excess power in 3 cm^3 wherein the excess power density and energy balance were high, 7.3 W/cm^3 and $-2.9 \, X10^4 \, kJ/mole \, H_2$, respectively[72],

62.) in the comparison of helium-hydrogen plasmas sources, the observation that i.) with an input power of 24.8± 1 W, the total plasma power of the Evenson microwave

[68] Reference No. 43
[69] Reference Nos. 34, 35
[70] Reference Nos. 50, 78
[71] Reference No. 76
[72] Reference Nos. 36, 63, 71, 73

helium-hydrogen plasma measured by water bath calorimetry was 49.1 ± 1 W corresponding to 24.3 ± 1 W of excess power in 3 cm^3 corresponding to a high excess power density and energy balance of 8.1 W/cm^3 and over $-3 \, X \, 10^4 \, kJ/mole \, H_2$, respectively, ii.) with an input of 500 W, a total power of 623 W was generated in a 45 cm^3 compound-hollow-cathode-glow discharge, iii.) less than 10% excess power was observed from inductively coupled RF helium-hydrogen plasmas, and iv.) no measurable heat was observed from MKS/Astex microwave helium-hydrogen plasmas that corresponded to the absence of H Balmer line broadening[73],

63.) the observation of energy balances of helium-hydrogen microwave plasmas of over 100 times the combustion of hydrogen and power densities greater than 10 W/cm^3 measured by water bath calorimetry[74],

64.) at the load matching condition of 600 Ω, the direct plasmadynamic conversion (PDC) of open circuit voltages of 11.5 V and ~200 mW of electrical power with a 0.125 in diameter by 3/4 in long plasmadynamic electrode and a 140 G applied field corresponding to an extracted power density of ~1.61 W/cm^3 and an efficiency of ~18.8%[75],

65.) at the load matching condition of 250 Ω, the direct plasmadynamic conversion (PDC) of open circuit voltages of 21.8 V and 1.87 W of electrical power with a 0.125 in diameter by 3/4 in long plasmadynamic electrode and a 140 G applied field corresponding to an extracted power density of 3.6 W/cm^3 and an efficiency of 42%[76],

66.) the projection that the generation of electricity using magnetohydrodynamic (MHD) conversion of the plasma particle energy of small to mid-size chemically assisted microwave or glow discharge plasma (ca-plasma) power sources in the range of a few

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[73] Reference Nos. 84, 98
[74] Reference Nos. 34-36, 50, 63, 71, 73, 76-78, 84
[75] Reference No. 48
[76] Reference No. 56

hundred Watts to several 10's of kW for microdistributed commercial applications appears feasible at 50% efficiency or better with a simple compact design[77],

67.) the differential scanning calorimetry (DSC) measurement of minimum heats of formation of KHI by the catalytic reaction of K with atomic hydrogen and KI that were over $-2000\ kJ/mole\ H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8\ kJ/mole\ H_2$[78],

68.) the isolation of novel hydrogen compounds as products of the reaction of atomic hydrogen with atoms and ions which formed an anomalous plasma as reported in the EUV studies[79],

69.) the synthesis and identification of a novel diamond-like carbon film terminated with $CH(1/p)$ (H^*DLC) comprising high binding energy hydride ions was synthesized for the first time from solid carbon by a microwave plasma reaction of a mixture of 10-30% hydrogen and 90-70% helium wherein He^+ served as a catalyst with atomic hydrogen to form the highly stable hydride ions and an energetic plasma[80],

70.) the synthesis of polycrystalline diamond films on silicon substrates without diamond seeding by a very low power microwave plasma reaction of a mixture of helium-hydrogen-methane (48.2/48.2/3.6%) wherein He^+ served as a catalyst with atomic hydrogen to form an energetic plasma with an average hydrogen atom temperature of $180\text{-}210\ eV$ versus $\approx 3\ eV$ for pure hydrogen and bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond[81],

71.) the synthesis of polycrystalline diamond films on silicon substrates without diamond seeding by a very low power microwave plasma reaction of a mixture of argon-

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[77] Reference No. 40
[78] Reference No. 25
[79] Reference Nos. 6-10, 19, 25, 38, 41, 44-45, 60-62, 75, 81, 87, 90, 92, 93, 100
[80] Reference No. 60
[81] Reference Nos. 64, 69, 88

hydrogen-methane (17.5/80/2.5%) wherein Ar^+ served as a catalyst with atomic hydrogen to form an energetic plasma with an average hydrogen atom temperature of $110 - 130\ eV$ versus $\approx 3\ eV$ for pure hydrogen and bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond[82],

72.) the identification of a novel highly stable surface coating $SiH(1/p)$ by time of flight secondary ion mass spectroscopy that showed SiH^+ in the positive spectrum and H^- dominant in the negative spectrum and by X-ray photoelectron spectroscopy which showed that the H content of the SiH coatings was hydride ions, $H^-(1/4)$, $H^-(1/9)$, and $H^-(1/11)$ corresponding to peaks at 11, 43, and 55 eV, respectively, and showed that the surface was remarkably stable to air[83],

73.) the isolation of novel inorganic hydride compounds such as $KH\,KHCO_3$ and KH following each of the electrolysis and plasma electrolysis of a K_2CO_3 electrolyte which comprised high binding energy hydride ions that were stable in water with their identification by methods such as (i) ToF-SIMS on $KH\,KHCO_3$ which showed inorganic hydride clusters $K[KH\,KHCO_3]_n^+$ and a negative ToF-SIMS dominated by hydride ion, (ii) X-ray photoelectron spectroscopy which showed novel peaks corresponding to high binding energy hydride ions, and (iii) ^1H nuclear magnetic resonance spectroscopy which showed upfield shifted peaks corresponding to more diamagnetic, high-binding-energy hydride ions[84],

74.) the identification of $LiHCl$ comprising a high binding energy hydride ion by time of flight secondary ion mass spectroscopy which showed a dominant H^- in the negative ion spectrum, X-ray photoelectron spectroscopy which showed $H^-(1/4)$ as a new peak at its predicted binding energy of 11 eV, ^1H nuclear magnetic resonance spectroscopy which showed an extraordinary upfield shifted peak of -15.4 ppm

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[82] Reference Nos. 82, 88
[83] Reference Nos. 45, 61, 100
[84] Reference Nos. 6-7, 9, 38, 41

corresponding to the novel hydride ion, and powder X-ray diffraction which showed novel peaks[85],

75.) the identification of novel hydride compounds by a number of analytical methods such as (i) time of flight secondary ion mass spectroscopy which showed a dominant hydride ion in the negative ion spectrum, (ii) X-ray photoelectron spectroscopy which showed novel hydride peaks and significant shifts of the core levels of the primary elements bound to the novel hydride ions, (iii) ^1H nuclear magnetic resonance spectroscopy (NMR) which showed extraordinary upfield chemical shifts compared to the NMR of the corresponding ordinary hydrides, and (iv) thermal decomposition with analysis by gas chromatography, and mass spectroscopy which identified the compounds as hydrides[86],

76.) the NMR identification of novel hydride compounds MH^*X wherein M is the alkali or alkaline earth metal, X, is a halide, and H^* comprises a novel high binding energy hydride ion identified by a large distinct upfield resonance[87],

77.) the replication of the NMR results of the identification of novel hydride compounds by large distinct upfield resonances at Spectral Data Services, University of Massachusetts Amherst, University of Delaware, Grace Davison, and National Research Council of Canada[88],

78.) the NMR identification of novel hydride compounds MH^* and MH_2^* wherein M is the alkali or alkaline earth metal and H^* comprises a novel high binding energy hydride ion identified by a large distinct upfield resonance that proves the hydride ion is different from the hydride ion of the corresponding known compound of the same composition[89],

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[85] Reference Nos. 44, 62
[86] Reference Nos. 6-10, 19, 25, 38, 41, 44-45, 60-62, 75, 81, 87, 90, 92, 93, 100
[87] Reference Nos. 10, 19, 41, 44, 62, 81
[88] Reference Nos. 19, 81
[89] Reference Nos. 19, 81

79.) the observation that the ^1H MAS NMR spectrum of novel compound $KH*Cl$ relative to external tetramethylsilane (TMS) showed a large distinct upfield resonance at -4.4 corresponding to an absolute resonance shift of -35.9 ppm that matched the theoretical prediction of $p = 4$, and the novel peak of $KH*I$ at -1.5 ppm relative to TMS corresponding to an absolute resonance shift of -33.0 ppm matched the theoretical prediction of $p = 2$[90],

80.) the observation that the predicted catalyst reactions, position of the upfield-shifted NMR peaks, and spectroscopic data for $H^-(1/2)$ and $H^-(1/4)$ were found to be in agreement[91],

81.) the isolation of fraction-principal-quantum-level molecular hydrogen $H_2(1/p)$ gas by liquefaction using an ultrahigh-vacuum, liquid nitrogen cryotrap, and the observations of novel peaks by cryogenic gas chromatography, a higher ionization energy than H_2 by mass spectroscopy, a unique EUV emission spectrum by optical emission spectroscopy that shifted with deuterium substitution in a region where no hydrogen emission has ever been observed that unequivocally confirmed the existence of lower-energy molecular hydrogen, and upfield shifted NMR peaks at 0.21, 2.18 and 3.47 ppm compared to that of H_2 at 4.63 ppm[92],

82.) the observation of singlet peaks upfield of H_2 with a predicted integer spacing of 0.64 ppm at 3.47, 3.02, 2.18, 1.25, 0.85, and 0.22 ppm identified as the consecutive series $H_2(1/2)$, $H_2(1/3)$, $H_2(1/4)$, $H_2(1/5)$, $H_2(1/6)$, and $H_2(1/7)$, respectively, and $H_2(1/10)$ at -1.8 ppm wherein $H_2(1/p)$ gas was isolated by liquefaction at liquid nitrogen temperature and by decomposition of compounds found to contain the corresponding hydride ions $H^-(1/p)$[93].

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[90] Reference No. 81
[91] Reference No. 81
[92] Reference Nos. 75, 87, 90, 92, 93, 94
[93] Reference No. 98

Applicant again respectfully demands that the Secret Committee consider and evaluate in detail all of this record evidence, which, to date, it has largely ignored. The scientific data disclosed in this extensive body of evidence was collected and peer-reviewed with great care by a group of highly qualified scientists capable of understanding every detail of Applicant's technology. The very least the Committee can do is to also carefully evaluate that data in detail, article by article, keeping an open mind, so that Applicant is given a full and fair opportunity to present his case. If and when the Secret Committee finally does so, Applicant believes it will find that the evidence overwhelmingly proves the existence of lower-energy hydrogen in accordance with his claimed invention.

If, on the other hand, the Committee should find true fault with any of that data on legitimate scientific grounds—not the kind of nitpicking Applicant has seen on theoretical grounds—it should communicate as much to afford Applicant the opportunity to respond. Such scientific give-and-take is the only way to advance the prosecution of this case.

Unfortunately, with continued prosecution of this and BlackLight's other applications, a far different pattern has emerged. The Secret Committee continues to set arbitrary and capricious hurdles designed to avoid considering Applicant's conclusive experimental evidence and thereby block his patents from issuing. Each time Applicant clears one of these hurdles, the Committee merely raises the bar.

For instance, the Secret Committee initially alleged that Applicant's disclosed hydrogen chemistry, which forms lower-energy hydrogen, related to the controversial concepts of "perpetual motion" and "cold fusion." When Applicant exposed those allegations as utter nonsense, the Committee quickly abandoned its indefensible position, arguing instead that BlackLight's lower-energy hydrogen technology violated unidentified laws of physics. Then, to cover up its failure to identify even a single physical law that was supposedly being violated, the Committee improperly placed the burden on Applicant to do so: "in order to establish enablement, applicant bears the

burden of providing the accepted scientific laws wrong or incomplete." When Applicant showed just the opposite is true—that Applicant's novel hydrogen chemistry complies with all physical laws, even at atomic and sub-atomic levels—the Secret Committee once again backpedaled and changed its position. The Committee then advanced vague assertions that Applicant's lower-energy hydrogen violated "ideas" of modern science and, later, that it contradicted "beliefs" in the scientific community.

The only consistency found throughout these myriad of absurd positions is the Secret Committee's use of each to excuse it from fairly considering and evaluating Applicant's scientific evidence that lower-energy hydrogen does indeed exist. Instead, the Committee prefers engaging in a theoretical debate to the exclusion of that evidence, pitting its favored quantum theory, with all of its far-fetched and disproved predictions, against Applicant's theory of classical quantum mechanics that correctly predicts the formation of lower-energy hydrogen.

Applicant has willingly engaged the Secret Committee in this debate, and will continue to do so if necessary, even though the patent laws do not require that he understand the precise theoretical basis for why his invention works. All the law requires is that he disclose his invention in sufficient detail to enable one of ordinary skill in the art how to practice it. Applicant has done precisely that and the Committee has failed in its burden to show otherwise.

Of course, the debate over these competing theories can go on indefinitely without resolution, which may be the Secret Committee's strategy. Engaging in that intellectual exercise, however, will not—indeed cannot—definitively settle the question of whether practicing Applicant's disclosed hydrogen chemistry results in the formation of lower-energy hydrogen. Like any good theoretical debate, this one can only be tested and ultimately settled by fairly analyzing the unprecedented amount of experimental evidence Applicant has submitted conclusively confirming the lower energy states of hydrogen.

Applicant has expended tens of millions of dollars amassing this experimental evidence. The least the Secret Committee can do is properly consider it. The Committee's view, however, appears to be that, because the existence of lower-energy hydrogen is <u>theoretically</u> impossible—at least according to its misguided view of quantum mechanics—it need not analyze any contrary evidence. Applicant is hard pressed to imagine an approach to patent examination any more arbitrary and capricious than that.

In the few isolated instances in which the Secret Committee does address Applicant's evidence, it comes up with ridiculous reasons for dismissing it without a fair hearing, again demonstrating an arbitrary and capricious approach. One prominent example occurred during Applicant's meeting with Examiner Vasudevan Jagannathan— one of the few Secret Committee members Applicant has been able to successfully identify—during the February 21, 2001 Interview of this and other BlackLight applications. Applicant had a brief opportunity to present some of his scientific evidence, which included spectroscopic data that is extraordinarily reliable in analyzing chemical compositions. Such data amounts to a "chemical fingerprint" that cannot be seriously disputed. Despite the conclusiveness of that evidence, Examiner Jagannathan dismissed it out of hand as nothing more than "a bunch of squiggly lines."

To put the absurdity of that comment in context, the PTO rationalized its withdrawal action in other copending BlackLight patent applications, in part, by citing a January 12, 2000 article written by the spokesman for one of Applicant's main competitors, the American Physical Society (APS). [March 22, 2000 Decision at page 7. (Attachment G)] In that article, Dr. Park made the following startling statement:

> The energy states of atoms are studied through their atomic spectra— light emitted at very specific wavelengths when electrons make a jump from one energy level to another. <u>The exact prediction of the hydrogen spectrum was one of the first great triumphs of quantum theory; it is the platform on which our entire understanding of atomic physics is built. The theory accounts perfectly for every spectral line.</u>

> There is no line corresponding to a "hydrino" state. Indeed there is no credible evidence at all to support Mills' claim. [See Attachment J]

The incredible irony here—one that cannot be easily overlooked—highlights once again the extreme arbitrary and capricious approach the Secret Committee has taken in examining this and other BlackLight applications. There is no question that the vitriol espoused by Dr. Park in his cited *Post* article was, at least, partially responsible for the PTO's suspect withdrawal of five allowed BlackLight applications from issue. And yet, despite the fact that the very article the PTO relies upon to deny Applicant his patents recognizes that spectroscopic data is extraordinarily reliable—indeed, the "platform on which our entire understanding of atomic physics is built"—the Secret Committee nonetheless continues to cavalierly ignore or dismiss that same data when submitted by Applicant.

Out of exasperation, Applicant queried Examiner Jagannathan during the February 21 Interview as to what type and quality of evidence would convince him that lower-energy hydrogen exists. The Examiner indicated that Applicant would have to publish his experimental evidence in peer-reviewed scientific journals before he considered that evidence to be reliable. As detailed above, Applicant has more than met the Secret Committee's new "publication" standard for considering experimental evidence by submitting over 90 scientific papers for publication. So far, over 50 of these papers have completed and passed the peer-review process by highly qualified Ph.D. referees.

The esteemed list of journals to which Applicant's experimental evidence has been submitted includes:

Applied Physics Letters;

Chemistry of Materials;

Electrochimica Acta;

Europhysics Letters;

European Journal of Physics;

European Physics Journal B;

Fuels and Energy;

IEEE Transactions on Plasma Science;

International Journal of Hydrogen Energy;

Journal of Applied Physics;

Journal of Hydrogen Energy;

Journal of Molecular Structure;

Journal of New Materials for Electrochemical Systems;

Journal of Physics D, Applied Physics;

Journal of Physical Chemistry A;

Journal of Plasma Physics;

Journal of Quantitative Spectroscopy and Radiative Transfer;

Journal Vacuum Science and Technology;

Materials Characterization;

New Journal of Physics;

Optical Materials;

Physics Essays;

Physica B;

Plasma Sources Science and Technology;

Solar Energy Materials & Solar Cells;

Thermochimica Acta;

Thin Solid Films;

Vacuum; and

Vibrational Spectroscopy.

Once again, however, the Secret Committee has raised the bar to patentability by arbitrarily and capriciously ignoring this vast body of evidence, apparently believing that its anonymous Committee members are better qualified than the numerous skilled

PhD's who peer-reviewed and approved Applicant's articles confirming the existence of lower-energy hydrogen.

The PTO's mishandling of the experimental evidence of record in this case is but one of several improper actions that have adversely effected Applicant's patent rights. Others include:

(1) illegally withdrawing or threatening to withdraw other copending BlackLight patent applications from issue, after initially allowing all claims, under highly suspicious circumstances that suggest possible interference by BlackLight's competitors;

(2) improperly examining this application by Secret Committee, effectively denying Applicant the right to confront the persons involved in that examination and ascertain whether those persons include BlackLight's competitors, or other outside influences, in breach of PTO confidentiality requirements; and

(3) refusing reasonable requests by Applicant and five U.S. Senators to divulge information relating to the events that triggered the PTO's withdrawal action, and the identity of all PTO employees and non-PTO personnel involved in examining BlackLight's applications.

These improper actions bear directly upon the prosecution of BlackLight's pending applications, yet Applicant's good faith efforts to discuss and resolve these and other outstanding issues have been either ignored or rejected out of hand. Applicant's latest overture was communicated directly to PTO Director James E. Rogan in a letter dated December 21, 2001, from BlackLight board member Dr. Shelby T. Brewer, who received his Ph.D. in Nuclear Engineering from M.I.T. and served as Assistant Energy Secretary in the Reagan administration. [See Attachment A]

As stated in his letter, Dr. Brewer's reasons for appealing to Director Rogan were motivated not only by his fiduciary duty to protect BlackLight's best interests, but also by a sincere desire to avoid unnecessary embarrassment to the PTO over these lingering issues if left unresolved. Dr. Brewer appealed for a meeting with Director Rogan in an

attempt to bring some closure to this matter in a way that might mutually benefit both sides.

Despite the urgency of his plea, Dr. Brewer waited over four months before finally receiving a response to his request for a meeting. In a curt letter dated April 24, 2002, from the Director's Chief-of-Staff, Jason C. Roe, the PTO advised: "We appreciate your interest in this matter, but, unfortunately, must decline your request for a meeting due to the fact that the USPTO is not in a position to discuss the issue at the present time." [See Attachment A]

This negative response, while disappointing, was hardly surprising. In refusing to meet with Applicant, the PTO continues to treat prosecution of this and BlackLight's other copending cases as an adversarial proceeding. While the PTO may believe it is justified in shrouding its untoward actions under a cloak of secrecy and remaining answerable to no one, that approach does little to preserve public confidence in the patent process. Only by openly engaging Applicant in mutually beneficial discussions of all the issues in this case can the PTO ever hope to achieve that worthy goal. Applicant therefore implores Director Rogan to reconsider his decision and adopt a more flexible and cooperative approach by agreeing to meet with Applicant to discuss the handling of this and other pending BlackLight applications before taking any further action.

Perhaps the PTO sees no need to modify its approach, buoyed by the Federal Circuit's June 28, 2002 Decision upholding its withdrawal action in other copending BlackLight patent applications. *See BlackLight Power, Inc. v. Director James E. Rogan*, 63 USPQ2d1534 (Fed. Cir. June 28, 2002) [See Attachment B]. The Federal Circuit ruled, among other things, that an "emergency situation" trumped the controlling regulation requiring the PTO to determine the unpatentability of one or more claims before it withdrew the '294 application from issue so that the PTO's mere "concern" over patentability provided adequate basis for the withdrawal. That Decision, aside from the

fact that it is erroneous,[94] does not even begin to resolve other issues that touch on the merits of this case.

One such issue is how this alleged "emergency situation" arose in the first place, i.e., how the PTO became aware of BlackLight's issued U.S. Patent No. 6,024,935 (the '935 patent) that supposedly raised "concerns" about other pending applications. That issue apparently was not important to Associate Solicitor Kevin Baer who defended the PTO's conduct by arguing to the District Court: "I would even say, Your Honor, you could imagine in our head any scenario of how we learned about it. A blimp flying over us. It doesn't matter, because what matters, Your Honor, is the decision [to withdraw] itself." [May 22, 2000 Transcript at 22 (Attachment K, Tab E)]

Judge Sullivan, however, was apparently unimpressed by those comments, noting in footnote 10 of his opinion that he was "troubled by several steps in the PTO's process" and advising the PTO to "examine its patent issuance process so that their

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[94] Applicant believes that the Federal Court's opinion is erroneous due, in part, to its misreading of a concurring opinion in a 38-year-old Supreme Court case to support its holding that this supposed "emergency situation" justified the PTO's withdrawing BlackLight's copending '294 application from issue on February 17, 2000, after payment of the issue fee. See BlackLight Power at page 7 citing Baltimore & Ohio Railroad Co. v. United States, 386 U.S. 372, 421 (1964) (Brennan, J., concurring) (recognizing the importance of leaving the Interstate Commerce Commission (ICC) great flexibility to deal with emergency situations to avoid serious damage to the national transportation system, but finding no pressing need that justified the ICC's action). The Federal Circuit stretched that case way beyond the limits of Supreme Court precedent requiring government agencies to strictly follow statutory and regulatory guidelines.

Incredibly, at oral argument, the PTO did not even suggest that an emergency situation had forced it to withdraw this application from issue on February 17, 2000. To the contrary, PTO Solicitor John M. Whealan argued that no withdrawal—emergency or otherwise—occurred on that date and admitted that, if the Court found otherwise, his case would be seriously compromised. This was because, at that time, the PTO could not locate the patent file and admittedly could not have made a determination of unpatentability of one or more claims as required by the controlling regulation. See 37 C.F.R. § 1.131(b)(3); MPEP § 1308 (7th Ed., Rev. 1, Feb. 2000). To avoid an adverse ruling, Solicitor Whealan sought refuge outside the administrative record, suggesting for the first time that the PTO had used the wrong form in mistakenly notifying Applicant on February 17 that his application had been withdrawn. Then, again without evidentiary support, the Solicitor tried to convince a skeptical Court that Director Kepplinger, in consultation with the Examiner, had made an unpatentability determination sometime later, after Applicant had voluntarily supplied the PTO with a copy of the application—hardly an emergency situation if it were true.

normal operations are not compromised by such seemingly suspicious procedures."
[See 109 F.Supp. 2d at 53 (See Attachment L)]

While the PTO may be unconcerned how it learned of the '935 patent, Applicant considers that information critically important. If, for instance, competitors were somehow involved in events leading to the withdrawal of BlackLight's allowed applications and, perhaps, in the subsequent prosecution of those and other applications, that information would relate directly to the credibility of the rejections entered in those cases, including this one. Applicant therefore renews his request for a full accounting of how, out of the thousands of patents the PTO issues every week, his '935 patent came to its attention, thus leading to the withdrawal of BlackLight's allowed applications.[95]

Applicant believes that concerns over outside influences on the prosecution of his applications are fully justified. Following the PTO's withdrawal action, counsel immediately investigated the facts and circumstances surrounding that action by questioning various PTO personnel. In discussions with Director Esther Kepplinger, she admitted to counsel that the withdrawal was a reaction to perceived heat—a "firestorm" as she put it—the PTO had received from an undisclosed outside source. Director Kepplinger further indicated that the withdrawal occurred only after BlackLight's '935 patent had been brought to the attention of then-Director Q. Todd Dickinson by Gregory Aharonian, another PTO outsider well known for publicly attacking issued U.S. patents.

Director Kepplinger's revelations are truly disturbing in that they describe what is, in essence, a newly created non-statutory reexamination procedure for opposing the issuance of patents never envisioned by Congress. *Compare* 35 U.S.C. §§ 301-307 (patent reexamination statutes).

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[95] See Applicant's February 28, 2000 letter to Director Kepplinger documenting telephone and personal conversations between her and Applicant's counsel regarding improper outside influence that precipitated the withdrawal of BlackLight's five allowed applications. The PTO cited this letter in its March 22, 2000 Decision affirming its withdrawal action. [See Attachment G]

This was but one of several issues Dr. Brewer raised in his letter to Director

Rogan as a possible topic for discussion that the PTO says it is "not in a position to

discuss . . . at the present time." The PTO's response, however, merely begs the

question: if not now, when?

Following the PTO's drastic withdrawal action, Applicant discovered other reliable

information suggesting outside interference with BlackLight's patent applications and

breaches of the PTO' s duty to maintain the confidentiality of those applications.

Applicant learned that Dr. Peter Zimmerman, former Chief Scientist for the State

Department, had published an Abstract of an upcoming speech to the American

Physical Society (APS)—a BlackLight competitor—boasting that his Department and

the Patent Office "have fought back with success" against BlackLight. [See Attachment

K, Tab C] In conversations with BlackLight's counsel, Dr. Zimmerman admitted that he

received information concerning BlackLight's applications through e-mails from Dr.

Robert Park, spokesman for the APS, who told him of a contact in the PTO referred to

by Dr. Park as "Deep Throat" with access to confidential patent information. [See

Attachment K, Tab C]

A recent September 2002 *APS News Online* bulletin suggests that Dr. Park, to

this day, has maintained his questionable PTO contacts, apparently with the agency's

blessing:

APS E-Board Passes Resolution on Perpetual Motion Machines

The APS Executive Board approved a resolution at its June 2002 meeting
in Annapolis, MD, affirming the fraudulent nature of claims of perpetual
motion machines.

The resolution was deemed necessary because of a recent increase in
patent applications for such devices. Robert Park, APS Director of Public
Information and author of the weekly electronic newsletter, "What's New,"
reported that the US Patent Office has received several patent
applications for perpetual motion machines during the first six months of
this year alone. [Park's 2000 book, *Voodoo Science*, devoted

considerable space to the phenomenon of such devices throughout history.] The text of the APS resolution follows.

The Executive Board of the American Physical Society is concerned that in this period of unprecedented scientific advance, misguided or fraudulent claims of perpetual motion machines and other sources of unlimited free energy are proliferating. Such devices directly violate the most fundamental laws of nature, laws that have guided the scientific progress that is transforming our world.

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[Attachment Q (emphasis added)] Dr. Park's knowledge of the number of pending patent applications filed in the PTO directed to a particular subject matter—information that is supposedly kept confidential—raises additional questions as to his activities in interfering with the prosecution of U.S. patent applications.

Of course, this should come as no surprise since Dr. Park has basically admitted his direct involvement in BlackLight's patent affairs, as evidenced by a recent issue of *What's New* he authored and published on the APS website:

The status of BlackLight Power's intellectual property is fuzzier than ever. BLP was awarded Patent 6,024,935 for "Lower-Energy Hydrogen Methods and Structures," a process for getting hydrogen atoms into a "state below the ground state". . . . You might expect these shrunken hydrogen atoms, called "hydrinos," to have a pretty special chemistry. Do they ever! Indeed, a second patent application titled "Hydride Compounds" had been assigned a number and BLP had paid the fee. Several other patents were in the works. That's when things started heading South. Prompted by an outside inquiry (who would do such a thing?), the patent director became concerned that this hydrino stuff required the orbital electron to behave "contrary to the known laws of physics and chemistry." The Hydride Compounds application [the '294 application] was withdrawn for further review and the other patent applications were rejected. [September 6, 2002 Online Newsletter of Dr. R. Park, *What's New* (Attachment C) (emphasis added)]

Dr. Park's startling admission was confirmed in a recent issue of the *Online Newsletter* published by the James Randi Educational Foundation (JREF), which, like Dr. Park, boasts of having contacted the Patent Office to sabotage applicants' patent rights:

> But why, hard on the heels of re-examining other questionable patents (see three weeks ago on this page), would the Patent Office have happened upon this particular one [BlackLight's withdrawn '294 application], when there are so many in this category? The secret can be inferred from Bob Park's weekly column, where we find: "<u>Prompted by an outside inquiry (who would do such a thing?)</u> . . ." <u>That rascal!</u>

> The very fact that the <u>Patent Office has paid heed to the complaints that Park, the JREF, and others have made</u>, speaks well for rationality. Let's hope that we can look forward to many quack devices and systems being re-evaluated. Let's see a lot more of this "extraordinary action" from the Director. As for BlackLight Power, says Park, "Their long-awaited IPO may have to wait a little longer." [September 20, 2002 Online Newsletter of the JREF, *Swift* (Attachment C) (emphasis added)]

Apparently, this is not the first time that these same players—Dr. Park, James Randi and PTO officials—have been embroiled in a patent controversy such as this one. Less than a year before Applicant's five allowed applications were withdrawn from issue in February 2000, the PTO was caught up in another scandal of sorts involving the issuance of U.S. Patent Nos. 5,748,088 and 6,011,476, granted on a device that can identify the obscured location of living entities. Following issuance of the '088 patent, Dr. Park published in his *What's New* newsletter inaccurate, disparaging remarks, which were picked up by James Randi on his JREF website, concerning the operation and reliability of the claimed invention. An article published in *Science Magazine* during the pendency of the '476 patent also reported on the controversy and the involvement of Sandia National Labs (SNL) in the testing of the device. [Attachment D] That involvement and the disclosure of confidential information to David Voss, author of the *Science* article, was itself the subject of some controversy and resulted in the issuance of an internal PTO memorandum that was placed in the '476 patent file.

In that memorandum, the PTO had to reiterate its policy forbidding PTO

employees from making public disclosures concerning pending patent applications:

PTO MEMORANDUM FOR ALL EMPLOYEES: MEDIA CONTACT POLICY

Posted Date: 06/25/99
Removal Date: 07/06/99

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER OF PATENTS AND
      TRADEMARKS
Washington, D.C. 20231

June 22, 1999

99-42

MEMORANDUM FOR All Employees

FROM: Acting Assistant Secretary of Commerce and Acting
      Commissioner of Patents and Trademarks

SUBJECT: Media Contact Policy

Since a memorandum on this subject was first issued several years ago,
thousands of new employees have joined the PTO. Therefore, it is a good
time to reiterate PTO policy concerning employee contact with members
of the media including, but not limited to, those in print, broadcast, cable,
and online publications.

All requests, including telephone and e-mail, from members of the media
for interviews, tours, and appearances should be directed to the Office of
Public Affairs (Richard Maulsby or Brigid Quinn). Public Affairs will then
determine the appropriate Office response for such requests and arrange
for all interviews and any other meetings with the media. A member of the
Public Affairs staff may attend interviews and meetings.

This policy applies only to contact with the media, not to interactions with customers. Any questions about media contact should be directed to the Office of Public Affairs at 305-8341.

Additionally, MPEP section 1701 and TMEP section 1801 specify that Office personnel should not comment on the validity or enforceability of any U.S. patent or trademark registration. These sections also caution employees about answering other particular inquiries concerning U.S. patents or trademark registrations. Any questions on this policy should be directed to your supervisor or to the MPEP Editor at 305-8813 for patents or to the Office of the Assistant Commissioner for Trademarks at 308-8900. [Attachment E]

Curiously, SNL is where Dr. Park previously served as head of its Surface Physics Division, leading Applicant to wonder whether SNL, or any of its sister labs, have had any similar involvement in the examination of this and other BlackLight applications. Applicant's curiosity on this point is further heightened by the fact that Examiner Bernard Eng-Kie Souw, a former employee with Brookhaven National Labs, was recently engaged in the examination of other copending BlackLight applications, including Serial No. 09/513,768.

Despite the obvious relevance of these and other such revelations, the PTO has refused to even acknowledge, much less address them. If, as Applicant suspects, the PTO has conferred with anyone having ties to the APS, like Dr. Park or Dr. Zimmerman, or to other BlackLight competitors in withdrawing or rejecting BlackLight's applications, that information would be highly relevant and thus must be disclosed. Clearly, knowing the identity and potential biases of all persons providing input or otherwise involved in rejecting BlackLight's applications, especially those with competing interests, bears directly on the credibility of those rejections.

Applicant has disclosed to the PTO on numerous occasions information relating to Dr. Park's undermining of BlackLight's patent rights, most recently in Dr. Brewer's letter to Director Rogan, only to be ignored. [See also, for example, January 19, 2001 Letter to Director Kepplinger (Attachment K)] As Dr. Brewer explained in his letter,

BlackLight is obviously concerned, among other things, that the PTO may have breached its duty to maintain confidentiality of U.S. patent applications under 35 U.S.C. § 122, 18 U.S.C. § 2071, 37 C.F.R. § 1.14, and M.P.E.P. § 101. The PTO's short statement that it is "not in a position to discuss the issue at the present time" does little to allay those concerns.

Even more distressing is Applicant's suspicion that patent rights to his novel hydrogen chemistry may have been compromised by a group of physicists with a vested interest in maintaining federal funding for projects based on a competing scientific theory and that those physicists continue to exert improper influence on the prosecution of BlackLight's pending applications.

Those suspicions are only fueled by the PTO's continued silence on these issues while undercutting Applicant's patent rights based on statements of competitors like Dr. Park. For instance, In its March 22, 2000 Decision, the PTO justified its withdrawal action by relying, in part, on a *Washington Post* article written by Dr. Park only slightly more than a month prior to the withdrawal:

> While petitioner in the accompanying letter points to favorable testimonials from scientists and entrepreneurs regarding the "revolutionary technology" that the instant application is asserted to embody, this does not establish that either the Director, Technology Center 1700, or the Director, Special Programs Law Office, committed reversible error, nor that the Notice should be withdrawn. In contrast, mainstream newspapers have reported this same "revolutionary technology" is accompanied by controversy in the scientific community. See Baard et al., Scientists and entrepreneurs have lots of ideas about new sources of energy; some may even be practical, Wall St. J., Sept. 13, 1999, at R16; **Park, Perpetual motion; still going around, Washington Post, Jan. 12, 2000, at H3.** [March 22 Decision at 7 (Attachment G)]

Applicant is naturally skeptical that this timing was simply a coincidence. Regardless, the mere fact that the PTO would rely on <u>any</u> competitor to "bad-mouth" BlackLight's technology is troubling. That it relied on Dr. Park of all people, known for

conducting "hatchet jobs" on new technologies that threaten federal funding for the physicists he represents, is contemptible.

The same *Washington Post* that ran Dr. Park's libelous article rebuked its less than credible author in a subsequent article confirming his reputation for engaging in what it described a "search-and-destroy mission" against inventors and scientists who seek to advance the bounds of science. [See Article dated June 25, 2000 (Attachment M)] To quote the article's exact words, "Park's anger permeates his rebuttals, which border on <u>character assassination</u>." Noting that "thoroughness is not Park's strong suit," the article goes on to suggest that his intentions may be less than honorable:

> Park's failure to gather first-hand data is unfortunate, but his selective omissions are far more serious. In at least one case, he violated basic principles of journalism and science itself by apparently <u>suppressing information that conflicts with his foregone conclusion</u>. . . . Such tactics are reminiscent of the behavior of a zealous DA who is so convinced that a suspect is guilty that he feels entitled to withhold some information from the jury.

Dr. Park's competitive motives in attacking BlackLight's novel hydrogen chemistry, and thereby undermining its patent rights, are clear, as further recognized by the *Post* article in its description of Dr. Park as "a Washington lobbyist and PR flack for the American Physical Society." The article goes on to warn of the serious effects a rush to judgment can have without first-hand review of experimental evidence:

> This is a serious matter, since even poorly documented vitriol can jeopardize a scientist's reputation and future funding if it is disseminated with the complicity of a respected organization such as the American Physical Society.

Incredibly, in rationalizing its withdrawal action, the PTO pays tribute to a "hatchet man" like Dr. Park, who never lets scientific evidence interfere with the sabotage of a competitor, by citing his hostile statements against BlackLight. Yet, in explaining the issuance of BlackLight's '935 patent, the PTO publicly denigrates its

entire examining corps, known for their careful study of experimental evidence in

deciding whether to issue U.S. patents:

> [P]atent examiners do review [patent applications]. Unfortunately, patent
> examiners are swamped and sometimes things slip through. [Statement
> of Associate Solicitor Baer in *BlackLight Power, Inc. v. Q. Todd Dickinson*,
> May 22, 2000 Tr. at 7 (Attachment K, Tab A)]

> [E]xaminers are under tremendous pressure to produce work, and if
> they're going to approve [an application], they just approve it and kind of
> let it out the door. [May 22, 2000 Tr. at 48 (Attachment K, Tab A)]

As Dr. Brewer pointed out in his letter to Director Rogan, the PTO, in making

these outrageous public statements, undercuts the statutory presumption of validity of

every U.S. patent it has ever issued over the past 50 years:

Presumption of validity; defenses

> A patent shall be presumed valid. Each claim of a patent (whether in
> independent, dependent, or multiple dependent form) shall be presumed
> valid independently of the validity of other claims; dependent or multiple
> dependent claims shall be presumed valid even though dependent upon
> an invalid claim. The burden of establishing invalidity of a patent or any
> claim thereof shall rest on the party asserting such invalidity.

Underlying this statutory presumption is the premise of administrative regularity,

which presumes that well-trained examiners with expertise in their respective fields

properly carry out their examination duties by issuing only valid patents. See, e.g.,

American Hoist & Derrick Co. v. Sowa & Sons, Inc., 725 F.2d 1350, 1359 (Fed. Cir.

1984). This presumption was, in fact, confirmed by the capable work of Examiners

Langel and Kalafut, who with over 50 years of experience between them, examined and

allowed Applicant's '935 patent, along with BlackLight's withdrawn applications. [96]

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[96] The Examiners initially rejected all claims in these cases, but after conducting five lengthy personal
interviews with Applicant and carefully considering Applicant's experimental evidence, they ultimately
allowed those claims.

As succinctly stated in Dr. Brewer's letter, Solicitor Baer's statements on behalf of the PTO should be alarming to just about everyone, with the possible exception of accused patent infringers, and most certainly do not reflect well on an agency charged with maintaining the integrity of the patent system. Applicant felt that a meeting with Director Rogan to secure a retraction of those statements would be mutually beneficial to both sides. Yet, once again, inexplicably, the PTO is not prepared to discuss this issue at the present time.

These and other unfair assaults on Applicant's patent rights leave him to ponder: What would motivate the PTO to conduct itself with such total disregard for U.S. patent laws and regulations governing its administrative authority just to attack this one Applicant?

Applicant's fear is that these attacks may be attributable to competitors, like Dr. Park, who are coordinating an organized smear campaign to discredit BlackLight's technology. That fear is only heightened by the PTO's hiding behind strained theoretical arguments as an excuse for refusing to fairly evaluate Applicant's experimental evidence, while using its Secret Committee to issue anonymous rejections in this and other BlackLight applications. Dr. Brewer also brought these issues to Director Rogan's attention as an agenda item for a meeting that, unfortunately, would never take place.

Applicant, however, has a right to know the identity and qualifications of all persons providing input to, or otherwise participating in, the examination process. This information bears directly on the credibility of the rejections that have been entered in this and other BlackLight applications. For instance, if Dr. Park or any of his physicist cronies have been consulted in denying Applicant his patent rights, it would certainly explain the arbitrary and capricious handling of the experimental evidence of record in those cases.

Particularly germane is the identity of those persons responsible for, or otherwise involved in, creating the substantive rejections of record in this case, including: (1) the

January 17, 2002 Office Action and attached 9-page Appendix (Paper No. 4); and (2) the September 9, 2002 Final Office Action with its 68-page "Attachment to Response to Applicants' Arguments" (Paper No. 8).

Furthermore, Applicant is entitled to know which PTO officials are ultimately responsible for analyzing Applicant's scientific data evidencing the existence of lower-energy hydrogen, and which officials have the final authority to decide the fate of BlackLight's applications. The Committee's unfair refusal to divulge that information has seriously handicapped Applicant's ability to effectively respond to and overcome the rejections of record.

For instance, Applicant has been stymied on numerous occasions in attempts to discover the basis for various positions articulated by the Secret Committee, or the status of certain actions it has taken. Seldom are the Examiners of record, who are mere signatories to the Secret Committee's handiwork, or their immediate supervisors, able to give any useful guidance on those subjects, either because they have no authority to do so and cannot divulge who does, or, in some cases, they do not know who even has custody of the patent file so as to investigate the answer to a particular question.

Knowing who is responsible for analyzing the record evidence would also allow Applicant to assess that person's qualifications, as compared to those Ph.D. scientists who peer reviewed the published experimental evidence confirming lower energy states of hydrogen. Equally important, by knowing who has authority to issue BlackLight's applications, Applicant can more easily ascertain and satisfy the patentability standards being applied in rejecting claims to his novel hydrogen technology.

Illustrating this last point, Applicant attempted to force the Secret Committee to set reasonable standards by which his data could be accepted as reliable proof by requesting the personal Interview that was held on February 21, 2001. Of course, to effectively determine the standards being applied against Applicant, he first had to identify the person(s) responsible for setting those standards.

Applicant, however, was only partially successful in that effort. Prior to the February 21 Interview, Applicant's counsel uncovered the identity of only one Secret Committee member, Examiner Vasu Jagannathan, who played a role in rejecting BlackLight's applications. Incredibly, Examiner Jagannathan initially denied any such involvement, accurately noting that his name did not appear anywhere in the record. He therefore refused counsel's explicit request that he attend the upcoming Interview. Only after counsel wrote to a high-level supervisor demanding that Examiner Jagannathan attend did counsel receive confirmation that the Examiner was "directly involved in the creation of the Office Action" to be discussed at the Interview and that he would indeed attend. [See January 19, 2001 letter to Director Esther Kepplinger (Attachment K) and February 12, 2001 Letter from Director Jacqueline M. Stone (Attachment N)]

Examiner Jagannathan confirmed his direct involvement by leading the Interview discussions. The Examiner's participation afforded Applicant an opportunity to assess his qualifications to examine and evaluate the experimental evidence of record. Applicant was astonished to hear Examiner Jagannathan basically admitted he was unqualified to do so based on several of his comments, including his characterization of Applicant's highly reliable spectroscopic data confirming lower energy states of hydrogen as a "bunch of squiggly lines." [See supra at p. 20.]

When pressed for guidance on what standards he used to evaluate Applicant's scientific data and to decide whether to issue his patents, Examiner Jagannathan would not elaborate. Rather, he proposed a new standard requiring Applicant to submit and publish his data in peer-reviewed journal articles before he would give it serious consideration. Despite strenuous objections to this newly minted standard, Applicant nonetheless worked diligently to comply with it.

Over the subsequent three years, Applicant used vast resources to present experimental evidence of lower energy states of hydrogen—much of it generated by independent third parties—in 50 peer-reviewed articles published in the prestigious scientific journals mentioned above. [See supra at pp. 22-23.] Despite this significant

accomplishment, the Secret Committee, true to form, has essentially ignored that published evidence.

It should be further noted that Applicant has successfully met the Secret Committee's new "publication" standard despite attempts by Applicant's detractors, most notably Dr. Zimmerman, to undermine that effort. [See Attachment H] Applicant's discovery that Dr. Zimmerman has been contacting various journals to dissuade publication of Applicant's articles is alarming given that the Committee has, in some BlackLight applications, relied on him to reject claims. If, as Applicant suspects, the Secret Committee has cooperated with Dr. Zimmerman or other biased individuals in denying Applicant his patent rights, while those same individuals have worked behind the scenes to undermine Applicant's compliance with the Committee's concocted publication requirement, again, that critical information should be disclosed without further delay.

Applicant is hardly surprised by his inability to break the PTO's code of silence on the suspicious handling of BlackLight's applications given that the PTO has stonewalled similar inquiries from five U.S. Senators—four of whom requested that Senator Patrick Leahy, Chairman of the Judiciary Committee overseeing the PTO, and/or Commerce Secretary Donald Evans, look into this matter. [See letters to and from Senators Max Cleland, Robert Torricelli, Jon Corzine, Ron Wyden, and Gordon Smith (Attachment O)] The PTO's continued refusal to respond to the Senators' inquiries suggests that, perhaps, it has something to hide.[97]

If the PTO looks to the Federal Circuit's June 28, 2002 Decision for license to continue its hostile prosecution through secret examination, it will not find it. Indeed,

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[97] In the PTO's reply to the Senators' inquiry letters, Robert L. Stoll, Administrator for External Affairs, contended that any comments in response to those inquiries would be "inappropriate" because of the then-pending appeal to the Federal Circuit in *BlackLight Power Inc. v. Dickinson*, Civ. No. 00-0422 (D.D.C). [See Attachment O] Putting aside the fact that the issues then on appeal had absolutely nothing to do with the points of inquiry, this contrived excuse has gone stale as the Federal Circuit decided that case well over a year ago in June 2002. [See Attachment B] By its own statements,

Judge Newman, in rationalizing her ruling, incorrectly assumed that the PTO would

fairly and expeditiously prosecute BlackLight's applications:

> Such action must of course be reasonable under the circumstances and
> rare in occurrence, lest the emergency become the rule. But when
> necessary in order to fulfill the PTO's mission, <u>with safeguards to the
> interests of the applicant including fair and expeditious further
> examination</u>, we agree with the district court that the action taken is a
> permissible implementation of the statute and regulation. [See *BlackLight
> Power* at pages 1537 (Attachment B) (emphasis added).]

Nothing could be further from the truth. As summarized above, the PTO's

prosecution of BlackLight's applications has been nothing short of hostile and

attempting to hide its actions behind the authority of a Secret Committee only

exacerbates the unfairness of those actions.

Applicant strongly urges the PTO to break its silence and engage in an open and

honest discussion of the issues that continue to plague BlackLight's applications.

Applicant renews his earlier commitment, as expressed in Dr. Brewer's December 21,

2001 letter, to meet with Director Rogan and any other government officials, anywhere,

anytime, to resolve these outstanding issues. Applicant sincerely hopes that the

Director will likewise commit himself to achieving the same objective so that a fair and

expeditious prosecution of BlackLight's applications that safeguards Applicant's

interests, as envisioned by Judge Newman, can move forward with mutually beneficial

results.

Part of that forward movement should include proper consideration of the

overwhelming experimental evidence confirming the utility and enablement of

Applicant's claimed invention. In view of that evidence, Applicant submits that the

rejections under 35 U.S.C. §§ 101 and 112 are misplaced and should be withdrawn,

and that the present application is in condition for allowance.

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nothing now prevents the PTO from cooperating with the U.S. Senate regarding the administrative
irregularities brought to its attention.

Discussions Held and Agreements Reached
During the February 11, 2003 Interview

The above-mentioned problems associated with the Secret Committee's examination of this and other BlackLight applications fall within the following four categories based on the Committee's failure to:

(1) identify all persons from within and outside the Patent Office who contributed to, or were otherwise involved in, withdrawing or rejecting BlackLight's applications;

(2) identify those persons having ultimate authority to analyze the vast body of experimental evidence demonstrating the existence of lower energy states of hydrogen and, based on that analysis, for deciding whether to issue patents on Applicant's novel hydrogen technology;

(3) establish and apply consistent patentability standards and guidelines by which that patentability decision is to be made; and

(4) properly analyze the evidence of record—now published, or to be published, in over 50 peer-reviewed journal articles—that the Committee required Applicant to submit.

The Secret Committee merely perpetuated those failures in its previous Office Actions by dismissing, without serious analysis, Applicant's submitted data evidencing lower energy states of hydrogen. Frustrated by the Committee's inaction, but still determined to get a fair hearing, Applicant requested and received the courtesy of a personal Interview, held February 11, 2003, to present his evidence and to discern the standards by which the ultimate decision-maker would be evaluating it.[98]

To that end, Applicant repeatedly requested that Examiner Jagannathan attend the Interview, since he had led the prior Interview held February 21, 2001, and, despite

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[98] Although the Interview Summary does not specifically list the serial number of all BlackLight applications as being the subject of the February 11, 2003 Interview, Examiners Langel and Kalafut agreed beforehand that the Interview would be held to address the similar rejection of claims in all assigned cases, such as this one, based on an alleged lack of utility and inoperability.

attempts to keep his identity secret, he was the only person known to have been directly involved in creating the substantive Office Actions of record. Specifically, Applicant sought to question Examiner Jagannathan on why he still refused to accept Applicant's scientific data evidencing lower-energy hydrogen after it had been published, or was soon to be published, in what was then over 40 (now over 50) peer-reviewed journal articles as required by the Examiner. Applicant, however, never got the chance to pose that question. Without explanation, Examiner Jagannathan refused to attend the Interview, just as he had refused to attend the Interview held two years earlier—only this time, he did not show up.

Applicant also requested that Examiners Wayne Langel and Stephen Kalafut attend the Interview, since they had previously allowed the five BlackLight applications that were mysteriously withdrawn from issue and their names remain the only ones appearing in the record as signers of the substantive Office Actions under consideration. Examiners Langel and Kalafut did appear for the Interview, together with their immediate supervisors, SPE's Patrick Ryan and Stanley Silverman. Examiner William Wayner, who is assigned to one BlackLight application and expressed an interest in attending the Interview, also appeared.

Also attending the Interview and leading the discussions on the PTO's behalf was Quality Assurance Specialist Douglas McGinty, who until that time had never been identified to Applicant as having played any role in the examination of his applications.

Attending the Interview on behalf of BlackLight Power were the inventor, Dr. Randell L. Mills, his counsel, Jeffrey S. Melcher and Jeffrey A. Simenauer, and company Director Dr. Shelby Brewer.

Also attending the Interview as an observer at Applicant's request was Ted C. Liu, Senior Legislative Assistant for Congressman David Wu, who represents the 1st District of Oregon.

During the Interview, Applicant made a sincere effort to advance the prosecution of his applications and to find common ground upon which all of these cases, once

again, would be allowed to issue as patents. Applicant believed it was a worthwhile effort in view of Examiner Langel's statements on the record reaffirming his consistent view that Applicant's novel hydrogen technology is fully operable and, therefore, entitled to patent protection. The Interview was also significant in view of the following representations and agreements that resulted from the discussions between Applicant and lead-Specialist McGinty:

(1) Applicant will identify the scientific data supporting lower energy states of hydrogen generated and furnished by independent third parties;

(2) the Examiners whose signatures appear on the rejections of record, *i.e.*, Examiners Langel, Kalafut, and Wayner, have full authority to review that data and, based on their review, to issue patents as deemed appropriate; and

(3) Applicant will confer with the signatory Examiners, either by telephone or in person, to review each assigned application on a claim-by-claim basis to ensure that the scientific data presented adequately supports the scope of the claims. For those claims determined to be adequately supported by the data, a patent will issue. For any claims deemed to be inadequately supported, Applicant reserves the right to continue seeking that broader claim coverage in subsequent proceedings.

Applicant appreciated the guidance Specialist McGinty provided during the Interview for securing BlackLight's patents. Based on that guidance, Applicant presented comments in several copending applications for which Responses were due detailing the substance of discussions held at the Patent Office on February 11th and identifying the independent, third-party data per agreement (1) above, which information is reproduced below. [See, for example, U.S. Serial Nos. 09/110,678 and 09/362,693]

Applicant's comments confirmed Examiner Langel's long-held view that the claims in those cases were in condition for allowance. Applicant therefore requested that Examiner Langel exercise his authority to issue a Notice to that effect per agreement (2) so that a patent could then be issued.

Following up on the Responses filed in those copending applications per agreement (3) above, Applicant arranged for an Interview with Examiner Langel to review the cases on a claim-by-claim basis to ensure that the scientific data presented adequately supported the scope of the claims in those cases. In fact, Applicant and Examiner Langel reached a tentative understanding that certain claims were adequately supported by the data and that Applicant was therefore entitled a patent.

Unfortunately for Applicant, that understanding was short-lived after Examiner Langel agreed, under the most grievous of circumstances, to his removal from examining all BlackLight applications to which he was assigned. Before discussing the negative aspects of that incident, however, Applicant presents the following recap of the discussions held during the February 11, 2003 Interview that lead to the above agreements. [99]

Just prior to the Interview, Specialist McGinty asked that Mr. Liu speak by telephone with Talis Dzenitis, a Congressional Affairs Specialist in the PTO's Legislative and International Affairs Office, to discuss his reasons for attending. Mr. Liu explained to Specialist Dzenitis that a constituent associated with BlackLight had contacted Congressman David Wu complaining of the irregular procedures the PTO has used in examining the company's pending patent applications. The procedures complained of included the PTO's withdrawal of the five applications approved by Examiners Langel and Kalafut for issuance as patents and the subsequent rejection of those and other BlackLight applications by an unknown group of PTO officials referred to by Applicant as a "Secret Committee."

Specialist Dzenitis represented to Mr. Liu that no such secret committee exists at the Patent Office. Applicant was surprised by that representation considering that a group of anonymous PTO officials are known to be handling BlackLight's applications

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[99] Much of the substance of these discussions was confirmed in e-mail correspondence between Mr. Liu and Applicant's Counsel. [See Attachment P]

and drafting the substantive Office Actions that the Examiners of record are instructed to sign.

Examiner Langel confirmed as much in an extended discussion he had with Mr. Liu and Applicant's counsel following the formal phase of the Interview. During that discussion, Examiner Langel repeated his prior denials of having authored the substantive Office Actions of record in the BlackLight applications to which he was assigned, even though those Actions bear his signature. Examiner Langel also repeated his previously expressed view that Applicant is entitled to patents on his novel hydrogen technology and that he wanted to issue those patents. Examiner Langel explained, however, that other PTO officials unknown to him having higher authority were responsible for drafting the substantive Office Actions he signed and for deciding whether to issue Applicant his patents.

The only person Examiner Langel could identify for Mr. Liu as "having something to do with the Office Actions" was Examiner Jagannathan, whose name does not appear on any Office Action. As noted above, Examiner Jagannathan kept his identity a secret from Applicant until counsel exposed his direct involvement in creating the Office Actions of record and forced him to attend the prior Interview that he led on February 21, 2001. When the recent February 11, 2003 Interview started, it was Specialist McGinty, another previously unidentified PTO official, who led the discussion.

Following the telephone conversation with Specialist Dzenitis, in which he denied the existence of a secret committee, Mr. Liu joined the Interview already in progress. Applicant began the Interview with a general discussion of his novel hydrogen technology and a presentation of the experimental evidence confirming its operation and utility. Specifically, Applicant explained to the PTO officials in attendance how independent laboratory studies, including those conducted by a leading Los Alamos researcher and by a NASA funded group, as well as other highly reliable scientific data, demonstrate the existence of lower energy states of hydrogen underlying his technology.

At no time during Applicant's presentation did the PTO officials analyze or otherwise address to any significant degree the merits of that data proving the existence of lower-energy hydrogen. Rather, these officials—with the exception of Examiner Langel—raised non-technical arguments, similar to those raised in the pending Office Actions, why lower-energy hydrogen could not exist and, thus, why they were justified in according the real-world data little or no weight.

The first such argument, raised by Examiner Wayner, was based on unrelated technologies that have been subjected to ridicule in the scientific community, such as perpetual motion, cold fusion, and 100-miles-per-gallon carburetors. Examiner Wayner compared those controversial technologies to BlackLight's novel hydrogen chemistry and then asked Applicant: "How is your invention any different?"

Applicant pointed out significant differences. Unlike the wild inventions mentioned by Examiner Wayner, Applicant explained that BlackLight has actually reduced its inventions to practice, as demonstrated by the many working prototype energy cells developed over the past 10 years and the novel chemical compounds produced by the process, which were made available to the PTO in the past and again during the Interview. In fact, Applicant invited the PTO officials to visit his laboratory in Cranbury, New Jersey and witness the operation of his energy cell for themselves, but like prior invitations, this one too was ignored.

Applicant further distinguished his claimed inventions based on the substantial body of experimental evidence that <u>corroborates</u> the existence of lower energy states of hydrogen. Again, none of the PTO officials who raised non-technical arguments questioning the operability of Applicant's novel hydrogen technology made any real attempt to analyze that corroborating evidence. Indeed, Examiner Wayner frankly admitted that his background was in Mechanical Engineering and, therefore, he was not qualified to conduct such an analysis.

Applicant acknowledges and appreciates Examiner Wayner's candor in this regard, which, as expressed throughout the Interview, has greatly assisted Applicant in

flushing out the key problems discussed above that have plagued this and other BlackLight's applications since the Secret Committee took over examination of these cases.

Examiner Wayner also questioned why, if BlackLight's technology was such an important discovery, the company had not yet developed a commercial device for producing energy. Applicant explained the high cost of developing commercial products and, because BlackLight was not in that end of the business, it was looking to license patents on its technology to companies who were, once those patents are issued.

Concerned that Examiner Wayner might be introducing yet another new patentability standard—the requirement of a commercial product—before agreeing to issue a patent, counsel pressed the Examiner on whether that was his intention. Examiner Wayner plainly stated it was not and, in response to a specific question from Mr. Liu, affirmed that Applicant need not prove commercial applicability to secure a patent for his invention.

Applicant also became alarmed when Examiner Wayner referred generally to BlackLight's "detractors," but then specifically invoked only the name of APS lobbyist and spokesman, Dr. Robert Park, as someone who disputes the existence of lower energy states of hydrogen. Applicant's counsel wanted to raise issues relating to Dr. Park's "Deep Throat" contact in the Patent Office and his reputation for conducting "hatchet jobs" on new technologies that threaten his lobbying of hundreds of millions of dollars in federal funding for its pet projects. Specialist McGinty, however, cut counsel off, refusing to discuss the matter. When Specialist McGinty suggested that BlackLight has a "similar agenda," noting its recent NASA contract, Applicant corrected him, explaining that BlackLight does not receive any government funding for its research. Specialist McGinty had no response and the discussion moved onto other, less controversial subjects.

Examiner Wayner raised other issues regarding the reliability of the scientific evidence presented by Applicant. That evidence included spectroscopic data, which

counsel described as being equivalent to a "chemical fingerprint." Counsel further noted that Dr. Park himself, whom Examiner Wayner identified as BlackLight's chief antagonist, has proclaimed the extraordinary reliability of spectroscopic data. [See supra at p. 21.]

Yet when Applicant tried to present this highly reliable spectroscopic data at the Interview showing the spectral lines corresponding to lower-energy hydrogen, *i.e.*, a "hydrino" state, Examiner Wayner interrupted, stating that "spectroscopic lines are meaningless" and "don't mean a hill of beans" to him.

Counsel again became concerned that BlackLight's applications were being evaluated using rather loose patentability standards. Counsel therefore requested that the PTO officials provide some guidance regarding the evidentiary requirements they were imposing on Applicant. Specialist McGinty and Examiner Wayner at first did not respond directly to Counsel's request for guidance, but rather began questioning the accuracy of the test data Applicant submitted to confirm the existence of lower energy hydrogen.

Applicant explained that the submitted test data was generated by highly qualified Ph.D. scientists, many of whom represent independent laboratories. Applicant further noted how this data had been extensively peer-reviewed in the 40-plus (now over 50) articles published, or soon to be published, in prestigious scientific journals, including the *Journal of Applied Physics*. Applicant also provided Specialist McGinty— much to his surprise—with specific data showing the lower-energy state spectral lines that were published in the prestigious spectroscopic publication, *Journal of Molecular Structure*.

Applicant was astounded by the refusal of Specialist McGinty and Examiner Wayner to accept the reliability of the scientific data appearing in these published journal articles, especially considering the PTO's routine acceptance of evidence submitted in printed publications to overcome utility rejections. See, *e.g.*, MPEP § 2107.01 (VI) pp. 2100-33 ("An applicant can [submit evidence in response to a utility

rejection] using any combination of the following: amendments to the claims, arguments or reasoning, or new evidence submitted in an affidavit or declaration under 37 CFR 1.132, or in **a printed publication.**") (emphasis added).

Counsel further reminded the PTO officials of the standard imposed by lead-Examiner Jagannathan during the previous Interview held February 21, 2001 that conditioned his consideration of evidence of lower-energy hydrogen on its publication in peer-reviewed journal articles based on the reliability of the peer-review process.

Counsel then noted once again that, despite Examiner Jagannathan's failure to provide legal authority for imposing this inflated standard, Applicant had not only met, but had exceeded it with over 40 journal articles (now over 50). Having done so, counsel expressed extreme frustration with the PTO's continued refusal to seriously analyze the published scientific data based on manufactured excuses, such as this most recent one concerning the accuracy of the data.

Specialist McGinty raised yet another weak excuse for ignoring the published data by asking what assurances Applicant could provide that the journal articles had been actually peer reviewed! Mystified by that question, Applicant could only state what is a simple known fact—to get scientific data published in a journal article, it must first go through a rigorous peer-review process. Indeed, many of Applicant's articles went through numerous drafts and required further experimentation as directed by the Ph.D. scientists who peer reviewed those articles.

At that point in the Interview, Specialist McGinty admitted that, like Examiner Wayner, he was not qualified to analyze the published data. Applicant was surprised by that admission, since the Interview was being led by Specialist McGinty and had been arranged for the express purpose of presenting the experimental evidence of record.

Examiner McGinty's admission merely fueled Applicant's prior concerns that the published scientific data was not being properly considered, prompting counsel to ask who was responsible for analyzing that data. Specialist McGinty replied by stating that Examiners Langel and Kalafut, the Examiners of record, had that responsibility. That

too came as a surprise, since Examiners Langel and Kalafut, of course, were the ones who had originally reviewed Applicant's experimental evidence in allowing the five BlackLight applications that were subsequently withdrawn from issue. Applicant, however, was relieved to learn that the two Examiners, with over 50 years of experience between them and obviously qualified to analyze the published data, were being reassigned that task.

Counsel then addressed the vexing problem of changing standards for patentability imposed throughout the examination process. Counsel specifically mentioned, for example, the prior Office Action claiming Applicant's lower-energy hydrogen technology violated known laws of physics and chemistry without specifically identifying even one such law, and then requiring Applicant to prove otherwise.

Counsel also cited a recent Office Action dismissing Applicant's scientific data out of hand for failing to prove the invalidity of quantum theory:

> The request for reconsideration has been entered and considered but does not overcome the rejection . . . because there is no evidence presented which would prove applicant's contention that the theory of quantum mechanics is invalid." [October 7, 2002 Advisory Action entered in U.S. Serial No. 09/110,717]

When Specialist McGinty accused Applicant of putting a "spin" on the Examiner's rejection, counsel noted that he had been reading the above quotation directly from the Office Action.

Counsel also mentioned recent Office Actions filed in BlackLight cases that dismissed Applicant's recent submission of peer-reviewed journal articles, in accordance with the standards imposed by Examiner Jagannathan, as being merely "cumulative" when it clearly was not and even the originally submitted evidence had not been properly analyzed.

Expressing frustration over the PTO's lack of any consistent patentability standard to guide Applicant, counsel once again requested that Specialist McGinty provide such guidance. Specialist McGinty again raised concern over the integrity of

the experimental evidence, but indicated that he would be more receptive to that evidence if it was validated by independent third parties.[100]

Applicant explained to Specialist McGinty that much of the evidence submitted over the previous four years was, in fact, generated by independent third parties. Applicant then began citing examples of the extensive independent third-party evidence disclosed in publications previously cited to the PTO, as well as some recently generated evidence, which has been submitted.[101] Specialist McGinty did not respond, whereupon counsel noted that his unfounded concern that the record evidence lacked third-party validation merely demonstrated the PTO's failure to thoroughly analyze that evidence.

Further demonstrating a lack of familiarity with the record evidence, Specialist McGinty criticized Applicant's experimental evidence as a whole by referring numerous times to only high-power plasma data. Applicant repeatedly pointed out that the plasma data was but a small fraction of the submitted evidence and that it was presented primarily to provide additional support for his plasma-related applications.

Applicant noted that the vast body of other scientific data he submitted relates to a broad range of analytical studies demonstrating the existence of lower energy states

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[100] Just as Specialist McGinty sought assurances at the February 11 Interview that persons involved in generating and furnishing the scientific data submitted by Applicant are independent and unbiased, Applicant deserves similar assurances that those involved in rejecting BlackLight's applications are also independent and unbiased. Despite Applicant's repeated requests for such assurances, none have been forthcoming.

[101] See: R. L. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", Int. J. Hydrogen Energy, Vol. 26, No. 9, (2001), pp. 965-979.
R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.
J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", Journal of Applied Physics, submitted.
A. J. Marchese, P. M. Jansson, J. L. Schmalzel, "The BlackLight Rocket Engine", Phase I Final Report, NASA Institute for Advanced Concepts Phase I, May 1-November 30, 2002, http://www.niac.usra.edu/files/studies/final_report/pdf/752Marchese.pdf.

of hydrogen. For example, regarding those applications relating to novel chemical compounds, Applicant pointed Specialist McGinty to the extensive spectroscopic data supporting the identification of those compounds. Specialist McGinty, however, apparently did not understand the significance of that data, stating that the NMR data confirming lower-energy hydrogen could have been due to nitrogen. Applicant had to explain that, as a matter of basic scientific knowledge, NMR data only shows protons and that no other element but hydrogen is in the data range. Applicant also explained that the NMR data confirms the presence of an internal energy source.

Knowing that highly qualified Examiners Langel and Kalafut were once again responsible for analyzing the published data was reassuring. There still remained, however, one nagging issue, namely, who had the ultimate authority to issue Applicant his patents. Counsel expressed concern that the pending applications were being examined in secret and that, without knowing who had that authority, Applicant was being unfairly denied an opportunity to present his case to the actual decision-maker.

Specialist McGinty then stated in no uncertain terms that Examiners Langel, Kalafut, and Wayner, the signers of the Office Actions under consideration, had "full authority" to examine the pending applications and to issue the patents.

Upon hearing that statement, counsel immediately turned to Examiner Langel and asked him point blank whether, after having studied the experimental evidence of record, he still believes that BlackLight's patent applications were allowable. The Examiner replied in no uncertain terms, "Yes, they're still allowable."

Counsel then asked Examiner Langel whether he was prepared to immediately allow the claims and issue Applicant his patents in those applications assigned to him, as is customary during an Interview, to which the Examiner replied, "Fine with me."

Specialist McGinty, however, expressed uneasiness over Examiner Langel's agreement to allow claims at the Interview. Specifically, he stated his concern that even if Applicant's claimed technology were found to be operable, there were still issues of novelty and nonobviousness to be addressed before a patent could be issued.

Counsel was surprised by that statement given the Secret Committee's arguments over the past three years that Applicant's inventions are inoperable based on an incorrect assumption that lower-energy hydrogen cannot possibly exist. Counsel pointed out the obvious contradiction in now arguing that the Examiners may still need to conduct a prior art search for possible disclosure of Applicant's lower-energy hydrogen technology.

Counsel further noted the PTO's own examination guidelines requiring Examiners to evaluate the operability and utility of a claimed invention together with its novelty and nonobviousness following a complete prior art search. See MPEP § 706.[102]

Counsel again turned to Examiner Langel to confirm whether that was his understanding. The Examiner replied that it was and indicated that, in fact, the first thing he did was to conduct a thorough prior art search because he thought that might be the easiest way to dispose of the applications assigned to him. Examiner Langel explained, however, that he was unable to reject the applications on prior art grounds, which was why he originally allowed them.

Counsel acknowledged Specialist McGinty's hesitance to issue Applicant patents covering his claims at the Interview and assured him that Applicant wanted to work with him to remove any lingering concerns. Counsel then specifically asked Specialist McGinty to articulate how they might proceed in trying to accomplish that mutually beneficial goal. In response, Specialist McGinty indicated that, in the next Response to the pending Office Actions, Applicant should focus on identifying the scientific data

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[102] MPEP § 706 provides in pertinent part:

After the application has been read and the claimed invention understood, a prior art search for the claimed invention is made. With the results of the prior art search, including any references provided by the applicant, the patent application should be reviewed and analyzed in conjunction with the state of the prior art to determine whether the claims define a useful, novel, nonobvious, and enabled invention that has been clearly described in the specification. The goal of examination is to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity.

generated by independent third-party testing, as opposed to test data generated solely by Applicant. Counsel agreed to do that.

Specialist McGinty further expressed concern over whether that scientific data, even if assumed to be reliable, was commensurate with the scope of the claims of the various applications to adequately support patentability. Counsel stated that Applicant's data did adequately support the claimed subject matter. Counsel, however, recommended reviewing the claims of each application one by one with the assigned Examiners to see if at least some agreement could be reached as to those claims that are adequately supported and for which patents can be issued. As for any remaining claims that the Examiners believe are not adequately supported by the scientific data, Applicant would be free to seek such broader claim coverage through continued prosecution.

Specialist McGinty agreed that this was a reasonable way to proceed and granted a request by counsel, Mr. Simenauer, that this agreement be memorialized in writing in an attachment to the Interview Summary Form. Mr. Simenauer offered to draft this agreement, as is common practice, and Specialist McGinty enthusiastically accepted the offer. Mr. Simenauer then drafted the following Attachment as Specialist McGinty looked on:

ATTACHMENT TO INTERVIEW SUMMARY FORM

Applicant requested that the following points discussed at the Interview held on February 11, 2003 be included as an Attachment to the Interview Summary Form.

Applicant's counsel and the Examiners in attendance at the Interview agreed to meet again at a future date, either in person or by telephone, to continue discussions regarding the patentability of Applicant's pending patent applications. Specifically, the Examiners expressed concern that Applicant's experimental evidence be commensurate with the scope of the claims. To address that concern, Applicant's counsel agreed with the Examiners to go

through the patent applications claim-by-claim with the Examiners and demonstrate how the scientific data supports those claims.

For those claims that are supported by the data, the PTO agrees to issue those claims. For those claims that the PTO determines are not supported by the data, Applicant will continue to seek that broader claim coverage in subsequent proceedings.

[Attachment F]

After completing the two-page handwritten Attachment, Mr. Simenauer read it out loud in the presence of Specialist McGinty and Examiner Langel so that they could confirm its accuracy and make any necessary changes. When asked by counsel whether they were satisfied with the wording of the Attachment, Specialist McGinty stated that he was, as did Examiner Langel, who then signed each of the two pages. There was absolutely no confusion as to the agreement to issue patents for those claims found to be supported by the scientific data.

Incredibly, in a transparent attempt to rewrite history, some unknown PTO official apparently instructed Examiner Langel to sign a subsequent communication mailed over two weeks later, on February 26, 2003, that included an attached "Supplement to Interview Summary" (Attachment F), which provides in pertinent part:

The following is a supplement to the summary concerning the February 11, 2003 interview re 09/501,622, etc. . . . A two-page Interview Summary was provided by Examiner Langel. A two page "Attachment to Interview Summary Form" also was provided by Mr. Simenauer. While the Attachment may represent the applicant's understanding of the interview, two points must be clarified.

First the second page of the applicant's attachment states in part: "for those claims that are supported by the data, the PTO agrees to issue those claims." The PTO made no such agreement. Instead, the PTO representatives indicated that the rejections under both 35 USC 101 and 112, 1st para., are outstanding and that evidence as to verification by credible, established, independent third parties would carry more persuasive weight.

Second, QAS Douglas McGinty was not listed in the Examiner's Interview Summary. He was present during the interview with the aforementioned attendees.

[signed]   Wayne Langel
                      Primary Examiner
                      Art unit 1754

If PTO officials want to retract one of the key agreements reached at the Interview, they should expressly say so, identifying who made the decision and giving reasons for the retraction. Otherwise, Applicant has no choice but to rely on the accuracy of the contemporaneous written record.

Moreover, in view of other agreements reached at the Interview, the suggestion that there was no agreement to issue patents under the stated conditions is absurd— though hardly surprising given the sordid prosecution history of BlackLight's patent applications. Specialist McGinty plainly stated on the record that the Examiners who signed the outstanding rejections have full authority to review the data and to issue Applicant his patents. Also of record is Examiner Langel's unequivocal statement that, based on his review, he is prepared to issue those patents. To then force this same Examiner to sign a statement two weeks after the fact denying that "for those claims that are supported by the data, the PTO agrees to issue those claims" is embarrassing.

Applicant's Identification of His Scientific Data Supporting Lower energy States of Hydrogen Generated and Furnished By Independent Third-Parties

In light of the controversial prosecution history of this and other pending BlackLight cases, Applicant appreciated what seemed to be Specialist McGinty's willingness to set reasonable standards and guidelines by which Applicant's patents could finally be issued. Indeed, Applicant acknowledged and documented Specialist McGinty's concern over the reliability of the record evidence, including his requirement that Applicant identify independent third-party verification of the scientific data as noted

in the Supplemental Interview Summary. With those standards and guidelines in mind, Applicant presented in several copending applications a summary of the scientific data supporting lower energy states of hydrogen generated and furnished by independent third parties, which is reproduced below. [103]

Experimental Evidence Generated by Independent Third Parties

Applicant is unaware of any statutes, rules, or case law requiring that experimental evidence submitted by an Applicant in response to a rejection by the PTO be generated by independent third parties. Despite the higher standard imposed by Specialist McGinty requiring such third-party validation of the evidence, Applicant still has met and far exceeded this standard as shown below.

Applicant provides an alphabetical listing of independent third-party laboratories and universities that conducted the experiments and generated the scientific data relied upon and discussed in the 45 analytical studies that follow this list:

Advanced Research - Pirelli Labs, Milan, Italy

Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base

Atomic Energy Canada Limited, Chalk River Laboratories

Brookhaven National Laboratory

Charles Evans & Associates, Sunnyvale, CA

Environmental Catalysis and Materials Laboratory of Virginia Polytechnic Institute

Franklin and Marshall College

Galbraith Laboratories, Inc., Knoxville, TN

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[103]   See, for example, U.S. Serial Nos. 09/110,678 and 09/362,693.

Grace Davison, Columbia, MD

IC Laboratories, Amawalk, NY

Idaho National Engineering Laboratory

Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany)

Jobin Yvon Inc., Edison, NJ

Laboratory for Electrochemistry of Renewed Electrode-Solution Interface
(LEPGER)

Liebert Corporation, Division of Emerson Corporation

Los Alamos National Laboratory

Material Testing Laboratory, Pennington, NJ

MIT Lincoln Laboratories

Moscow Power Engineering Institute

NASA Lewis

National Research Council of Canada

PacifiCorp

Pennsylvania State University Chemical Engineering Department

Perkin-Elmer Biosystems, Framingham, MA

Ricerca, Inc., Painesville, Ohio

Rider University, Lawrenceville NJ

Rowan University Professors A. J. Marchese, P. M. Jansson, J. L. Schmalzel

Ruhr University, Bochum, Germany

Shrader Analytical & Consulting Laboratories

Spectral Data Services, Inc., Champaign, IL

S. S. W., University of Western Ontario, Canada

Surface Science Laboratories, Mountain View, CA

Thermacore, Inc., Lancaster, PA

University of Delaware, Wilmington, DE

University of Massachusetts Amherst, Amherst, MA

University of New Mexico

Westinghouse Electric Corporation

Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA

The following 47 abstracts briefly describe the analytical studies of the scientific data generated by these independent third parties (highlighted in underline).

Independent Test Results

47. **R. L. Mills, P. Ray, M. Nansteel, J. He, X. Chen, A. Voigt, B. Dhandapani, Luca Gamberale, "Energetic Catalyst-Hydrogen Plasma Reaction as a Potential New Energy Source", European Physical Journal D, submitted.**
   Luca Gamberale of the Advanced Research - Pirelli Labs, Milan, Italy performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. The prior reported results of BlackLight Power, Inc. of a chemically generated hydrogen plasma, extraordinarily broadened atomic hydrogen lines, lower-energy atomic, molecular, and molecular-ion hydrogen lines, the isolation and characterization of lower-energy molecular hydrogen gas, and excess power measured by water bath calorimetry were replicated.

Specifically, plasmas of certain catalysts such as Sr^+, Ar^+, Ne^+, and He^+ mixed with hydrogen were studied for evidence of a novel energetic reaction. A hydrogen plasma was observed to form at low temperatures (e.g. $\approx 10^3\ K$) and an extraordinary low field strength of about 1-2 V/cm when argon and strontium were present with atomic hydrogen. RF and microwave plasmas were used to generate He^+, Ne^+, and Ar^+ catalysts. Extraordinarily fast H (40-50 eV) was observed by Balmer α line broadening only from plasmas having a catalyst with H. Novel extreme ultraviolet (EUV) emission lines were observed that corresponded to a Rydberg series of H corresponding to fractional principal quantum numbers wherein $n = \dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{4}, ..., \dfrac{1}{p}$; ($p \leq 137$ is an integer) replaces the well known parameter n = integer in the Rydberg equation for hydrogen excited states. Corresponding emission due to fraction-principal-quantum-level hydrogen molecular ion $H_2^+(1/p)$ and molecular hydrogen $H_2(1/p)$ were also observed. $H_2(1/p)$ gas was isolated by liquefaction using an high-vacuum (10^{-6} Torr) capable, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), visible and EUV optical emission spectroscopy (OES), and ^1H NMR of the condensable gas dissolved in $CDCl_3$ performed at Rider University, Lawrenceville NJ. Novel peaks were observed by cryogenic gas chromatography performed on the condensable gas which was highly pure hydrogen by MS and had a higher ionization energy than H_2. A unique EUV emission spectrum was observed by OES. The observation that the novel EUV emission spectrum shifted with deuterium substitution in a region where no hydrogen emission has ever been observed strongly supported the existence of lower-energy molecular hydrogen. Contaminants and exotic helium-hydrogen species were eliminated as the source of the reaction and condensed gas plasma emission spectra. Upfield shifted NMR peaks were observed at 3.22, 3.25, and 3.47 ppm compared to that of H_2 at 4.63 ppm. Excess power was absolutely measured from the helium-hydrogen plasma. For an input of 44.3 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 62.9 W corresponding to 18.6 W of excess power in 3 cm^3. The excess power density and energy balance were high, 6.2 W/cm^3 and -5×10^4 $kJ/mole\ H_2$ ($240\ eV/H\ atom$), respectively.

46. **R. Mills, B. Dhandapani, M. Nansteel, J. He, P. Ray, "Liquid-Nitrogen-Condensable Molecular Hydrogen Gas Isolated from a Catalytic Plasma Reaction", J. Phys. Chem. B, submitted.**

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \, eV$ where $q = 1,2,3,4,6,7,8,9,11$ or these discrete energies less $21.2 \, eV$ corresponding to inelastic scattering of these photons by helium atoms due to excitation of $He \, (1s^2)$ to $He \, (1s^1 2p^1)$. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen, formed by a resonant nonradiative energy transfer to He^+. Corresponding emission due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at $E_{D+vib} = p^2 E_{D\,H_2} \pm \left(\dfrac{\upsilon^*}{3}\right) E_{vib\,H_2(\upsilon=0\rightarrow\upsilon=1)}$, $\upsilon^* = 1,2,3...$

was observed at the longer wavelengths for $\upsilon^* = 2$ to $\upsilon^* = 32$ and at the shorter wavelengths for $\upsilon^* = 1$ to $\upsilon^* = 16$ where $E_{D\,H_2}$ and $E_{vib\,H_2(\upsilon=0\rightarrow\upsilon=1)}$ are the experimental bond and vibrational energies of H_2, respectively. Fraction-principal-quantum-level molecular hydrogen $H_2(1/p)$ gas was isolated by liquefaction using an high-vacuum (10^{-6} torr) capable, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), visible and EUV optical emission spectroscopy (OES), and ^1H NMR of the condensable gas dissolved in $CDCl_3$ performed at <u>Rider University, Lawrenceville NJ</u>. Novel peaks were observed by cryogenic gas chromatography performed on the condensable gas which was highly pure hydrogen by MS and had a higher ionization energy than H_2. A unique EUV emission spectrum was observed by OES. The observation that the novel EUV emission spectrum shifted with deuterium substitution in a region where no hydrogen emission has ever been observed unequivocally confirmed the existence of lower-energy molecular hydrogen. Contaminants and exotic helium-hydrogen species were eliminated as the source of the reaction and condensed gas plasma emission spectra. Upfield shifted NMR peaks were observed at 3.22 and 3.47 ppm compared to that of H_2 at 4.63 ppm. A theoretical rocketry propellant reaction is given that may be transformational.

45. **Dr. K.D. Keefer, Report on BlackLight Power Technology: Its Apparent Scientific Basis, State of Development and Stability for Commercialization by Liebert Corporation, (2001), and, Report on BlackLight Power Technology: Its Apparent Scientific Basis, State of Development and Stability for Commercialization, (2002).**

To separate reports disclosing the results of NMR, ToF-SIMS, XPS identification of novel hydrino hydride compounds and analysis of chemically-produced plasma by an expert hired by the Liebert Corporation, a division of the well-known and highly-respected Emerson Corporation. According to the expert's own words, he "observed demonstrations of the BlackLight Power (BLP) process and ...reached the inescapable conclusion that it is based on extraordinary chemical reactions that seem to release extraordinary amounts of energy.... It is [his] professional opinion that the BLP process represents a chemical conversion of atomic hydrogen unlike any previously reported [in] the archival scientific literature." Although the expert states that he was skeptical of Applicant's theory, he admitted that the chemical and plasma data did support Applicant's fractional quantum states and that he could offer no other explanation of the data using conventional quantum theory.

44. **A. J. Marchese, P. M. Jansson, J. L. Schmalzel, "The BlackLight Rocket Engine", Phase I Final Report, NASA Institute for Advanced Concepts Phase I, May 1-November 30, 2002, http://www.niac.usra.edu/files/studies/final_report/pdf/752Marchese.pdf.**
Rowan University Professors A. J. Marchese, P. M. Jansson, J. L. Schmalzel performed verification studies as visiting researchers at BlackLight Power, Cranbury, NJ. The prior reported results of BlackLight Power, Inc. of extraordinarily broadened atomic hydrogen lines, population inversion, lower-energy hydrogen lines, and excess power measured by water bath calorimetry were replicated. The application of the energetic hydrogen to propulsion was studied.

Specifically, the data supporting hydrinos was replicated. See

i.) BlackLight Process Theory (pp. 10-12) which gives the theoretical energy levels for hydrinos and the catalytic reaction to form hydrinos,

ii.) Unique Hydrogen Line Broadening in Low Pressure Microwave Water Plasmas (pp. 25-27, particularly Fig. 21) which shows that in the same microwave cavity driven at the same power, the temperature of the hydrogen atoms in the microwave plasma where the hydrino reaction was active was 50 times that of the control based on the spectroscopic line widths,

iii.) Inversion of the Line Intensities in Hydrogen Balmer Series (pp. 27-28, particularly Fig. 22) which shows for the first time in 40 years of intensive worldwide research that atomic

hydrogen population inversion was achieved in a steady state plasma and supports the high power released from the reaction of hydrogen to form hydrinos,

iv.) Novel Vacuum Ultraviolet (VUV) Vibration Spectra of Hydrogen Mixture Plasmas (pp. 28-29, particularly Fig. 23) which shows a novel vibrational series of lines in a helium-hydrogen plasmas at energies higher than any known vibrational series and it identically matches the theoretical prediction of 2 squared times the corresponding vibration of the ordinary hydrogen species, and

v.) Water Bath Calorimetry Experiments Showing Increased Heat Generation (pp. 29-30, particularly Fig. 25) that shows that with exactly the same system and same input power, the heating of the water reservoir absolutely measured to 1% accuracy was equivalent to 55 to 62 W with the catalyst-hydrogen mixture compared to 40 W in the control without the possibility of the reaction to form hydrinos.

43. J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", Journal of Applied Physics, submitted.

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. Water bath calorimetry was used to demonstrate one more peculiar phenomenon associated with a certain class of mixed gas plasmas termed resonant transfer, or rt-plasmas. Specifically, He/H_2(10%) (500 mTorr), Ar/H_2(10%) (500 mTorr), and $H_2O(g)$ (200 mTorr) plasmas generated with an Evenson microwave cavity consistently yielded on the order of 50% more heat than non rt-plasma (controls) such as He, Kr, Kr/H_2(10%), under identical conditions of gas flow, pressure, and microwave operating conditions. The excess power density of rt-plasmas was of the order $10 \ W \cdot cm^{-3}$. In earlier studies with these same rt-plasmas it was demonstrated that other unusual features were present including dramatic broadening of the hydrogen Balmer series lines, unique vacuum ultraviolet (VUV) lines, and in the case of water plasmas, population inversion of the hydrogen excited states. Both the current results and the earlier results are completely consistent with the existence of a hitherto unknown exothermic chemical reaction, such as that predicted by Mills, occurring in rt-plasmas.

42. **R. L. Mills, P. C. Ray, R. M. Mayo, M. Nansteel, B. Dhandapani, J. Phillips, "Spectroscopic Study of Unique Line Broadening and Inversion in Low Pressure Microwave Generated Water Plasmas", Physics of Plasmas, submitted.**

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. It was demonstrated that low pressure (~ 0.2 Torr) water vapor plasmas generated in a 10 mm ID quartz tube with an Evenson microwave cavity show at least two features which are not explained by conventional plasma models. First, significant (> 2.5 Å) hydrogen Balmer α line broadening was recorded, of constant width, up to 5 cm from the microwave coupler. Only hydrogen, and not oxygen, showed significant line broadening. This feature, observed previously in hydrogen-containing mixed gas plasmas generated with high voltage DC and RF discharges was explained by some researchers to result from acceleration of hydrogen ions near the cathode. This explanation cannot apply to the line broadening observed in the (electrodeless) microwave plasmas generated in this work, particularly at distances as great as 5 cm from the microwave coupler. Second, dramatic inversion of the line intensities of both the Lyman and Balmer series, again, at distances up to 5 cm from the coupler were observed. The dramatic line inversion suggests the existence of a hitherto unknown source of pumping of the optical power in plasmas. Finally, it is notable that other aspects of the plasma including the OH^* rotational temperature and low electron concentrations are quite typical of plasmas of this type.

41. **H. Conrads, R. Mills, Th. Wrubel, "Emission in the Deep Vacuum Ultraviolet from a Plasma Formed by Incandescently Heating Hydrogen Gas with Trace Amounts of Potassium Carbonate", Plasma Sources Science and Technology, Vol. 12, (2003), pp. 389-395.**

The generation of a hydrogen plasma with intense extreme ultraviolet and visible emission was observed at Ruhr University, Bochum, Germany from low pressure hydrogen gas (0.1-1 mbar) in contact with a hot tungsten filament only when the filament heated a titanium dissociator coated with K_2CO_3 above 750°C. The dissociator was electrically floated, and the electric field strength from the filament was about 1 V/cm, two orders of magnitude lower than the starting voltages measured for gas glow discharges. The emission

of the H_α and H_β transitions as well as the L_α and L_β transitions were recorded and analyzed. The plasma seemed to be far from thermal equilibrium, and no conventional mechanism was found to explain the formation of a hydrogen plasma by incandescently heating hydrogen gas with the presence of trace amounts of K_2CO_3. The temporal behavior of the plasma was recorded via hydrogen Balmer alpha line emission when all power into the cell was terminated. A two second decay of the plasma was observed after a fast decay of the electric field to zero. The plasma was found to be dependent on the chemistry of atomic hydrogen with potassium since no plasma formed with Na_2CO_3 replacing K_2CO_3 and the time constant of the emission following the removal of all of the power to the cell matched that of the cooling of the filament and the resulting shift from atomic to molecular hydrogen. Our results indicate that a novel chemical power source is present that forms the energetic hydrogen plasma. The plasma is a potential new light source.

40. R. Mills, "Observation of Extreme Ultraviolet Emission from Hydrogen-KI Plasmas Produced by a Hollow Cathode Discharge", Int. J. Hydrogen Energy, Vol. 26, No. 6, (2001), pp. 579-592.

A high voltage discharge of hydrogen with and without the presence of a source of potassium, potassium iodide, in the discharge was performed at Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany) with a hollow cathode. It has been reported that intense extreme ultraviolet (EUV) emission was observed at low temperatures (e.g. $< 10^3\ K$) from atomic hydrogen and certain atomized elements or certain gaseous ions which ionize at integer multiples of the potential energy of atomic hydrogen, $27.2\ eV$ [1, 3-5]. Two potassium ions or a potassium atom may each provide an electron ionization or transfer reaction that has a net enthalpy equal to an integer multiple of $27.2\ eV$. The spectral lines of atomic hydrogen were intense enough to be recorded on photographic films only when KI was present. EUV lines not assignable to potassium, iodine, or hydrogen were observed at 73.0, 132.6, 513.6, 677.8, 885.9, and 1032.9 Å. The lines are assigned to transitions of atomic hydrogen to lower energy levels corresponding to lower energy hydrogen atoms called hydrino atoms and the emission from the excitation of the corresponding hydride ions formed from the hydrino atoms.

39. **R. Mills, "Temporal Behavior of Light-Emission in the Visible Spectral Range from a Ti-K$_2$CO$_3$-H-Cell', Int. J. Hydrogen Energy, Vol. 26, No. 4, (2001), pp. 327-332.**

Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany) reports the generation of a hydrogen plasma and extreme ultraviolet emission as recorded via the hydrogen Balmer emission in the visible range. Typically a hydrogen plasma is generated and the emission of extreme ultraviolet light from hydrogen gas is achieved via a discharge at high voltage, a high power inductively coupled plasma, or a plasma created and heated to extreme temperatures by RF coupling (e.g. $> 10^6$ K) with confinement provided by a toroidal magnetic field. The observed plasma formed at low temperatures (e.g. $\approx 10^3$ K) from atomic hydrogen generated at a tungsten filament that heated a titanium dissociator coated with potassium carbonate. The temporal behavior of the plasma was recorded via hydrogen Balmer alpha line emission when all power into the cell was terminated. A two second decay of the plasma was observed after a fast decay of the electric field to zero. The persistence of emission following the removal of all of the power to the cell indicates that a novel chemical power source is present that forms an energetic plasma in hydrogen. No unusual behavior was observed with the control sodium carbonate.

38. **R. Mills, J. Sankar, P. Ray, J. He, A. Voigt, B. Dhandapani, "Synthesis and Characterization of Diamond Films from MPCVD of an Energetic Argon-Hydrogen Plasma and Methane ", J. of Materials Research, submitted.**

Polycrystalline diamond films were synthesized on silicon substrates by a low power (~80 W) microwave plasma chemical vapor deposition (MPCVD) reaction of a mixture of argon-hydrogen-methane (17.5/80/2.5%). The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA), scanning electron microscopy (SEM) (S. S. W., University of Western Ontario, Canada), and X-ray diffraction (XRD) (IC Laboratories, Amawalk, NY). It is proposed that Ar^+ served as a catalyst with atomic hydrogen to form an energetic plasma. CH, C_2, and C_3 emissions were observed with significantly broadened H α line. The average hydrogen atom temperature of a argon-hydrogen plasma was measured to be 110–130 eV versus ≈ 3 eV for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis

reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the CO tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

37. **R. Mills, P. Ray, B. Dhandapani, W. Good, P. Jansson, M. Nansteel, J. He, A. Voigt, "Spectroscopic and NMR Identification of Novel Hydride Ions in Fractional Quantum Energy States Formed by an Exothermic Reaction of Atomic Hydrogen with Certain Catalysts", J. Phys. Chem. A, submitted.**

$2K^+$ to $K + K^{2+}$ and K to K^{3+} provide a reaction with a net enthalpy equal to the one and three times the potential energy of atomic hydrogen, respectively. The presence of these gaseous ions or atoms with thermally dissociated hydrogen formed a so-called resonance transfer (rt) plasma having strong VUV emission with a stationary inverted Lyman population. Significant line broadening of the Balmer α, β, and γ lines of 18 eV was observed, compared to 3 eV from a hydrogen microwave plasma. Emission from rt-plasmas occurred even when the electric field applied to the plasma was zero as recorded at Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany. The reaction was exothermic since excess power of 20 $mW \cdot cm^{-3}$ was measured by Calvet calorimetry. An energetic catalytic reaction was proposed involving a resonant energy transfer between hydrogen atoms and $2K^+$ or K to form very stable novel hydride ions $H^-(1/p)$ called hydrino hydrides having a fractional principal quantum numbers $p = 2$ and $p = 4$, respectively. Characteristic emission was observed from K^{2+} and K^{3+} that confirmed the resonant nonradiative energy transfer of 27.2 eV and $3 \cdot 27.2$ eV from atomic hydrogen to $2K^+$ and K, respectively.

The predicted binding energy of $H^-(1/2)$ of 3.0471 eV with the fine structure was observed at 4071 Å, and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213 \, X \, 10^{-5} + 3.0563 \, eV$ (j is an integer) matched those observed for $j = 1$ to $j = 37$ to within a 1 part per 10^4. $H^-(1/4)$ was observed spectroscopically at $110 \, nm$ corresponding to its predicted binding energy of $11.2 \, eV$. The ^1H MAS NMR spectrum (Spectral Data Services, Inc., Champaign, IL) of novel compound $KH * Cl$ relative to external tetramethylsilane (TMS) showed a large distinct upfield resonance at -4.4 corresponding to an absolute resonance shift of -35.9 ppm that matched the theoretical prediction of $p = 4$. A

novel NMR (Grace Davison, Columbia, MD and Spectral Data Services, Inc., Champaign, IL) peak of $KH*I$ at -1.5 ppm relative to TMS corresponding to an absolute resonance shift of -33.0 ppm matched the theoretical prediction of p = 2. The predicted catalyst reactions, position of the upfield-shifted NMR peaks, and spectroscopic data for $H^-(1/2)$ and $H^-(1/4)$ were found to be in agreement.

36. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Novel Liquid-Nitrogen-Condensable Molecular Hydrogen Gas", Polish Journal of Chemistry, submitted.

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \ eV$ where $q = 1,2,3,4,6,7,8,9,11$ or these discrete energies less $21.2 \ eV$ corresponding to inelastic scattering of these photons by helium atoms due to excitation of $He \ (1s^2)$ to $He \ (1s^1 2p^1)$. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen, formed by a resonant nonradiative energy transfer to He^+. Corresponding emission due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at $E_{D+vib} = p^2 E_{D \, H_2} \pm \left(\dfrac{\upsilon*}{3}\right) E_{vib \, H_2(\upsilon=0 \rightarrow \upsilon=1)}$, $\upsilon* = 1,2,3...$

was observed at the longer wavelengths for $\upsilon* = 2$ to $\upsilon* = 32$ and at the shorter wavelengths for $\upsilon* = 1$ to $\upsilon* = 16$ where $E_{D \, H_2}$ and $E_{vib \, H_2(\upsilon=0 \rightarrow \upsilon=1)}$ are the experimental bond and vibrational energies of H_2, respectively. Fractional-principal-quantum-level molecular hydrogen $H_2(1/p)$ gas was isolated by liquefaction using an ultrahigh-vacuum, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), optical emission spectroscopy (OES), and ^1H NMR (Rider University, Lawrenceville NJ) of the condensable gas dissolved in $CDCl_3$. The condensable gas was highly pure hydrogen by GC and MS and had a higher ionization energy than H_2. An upfield shifted NMR peak was observed at 3.25 ppm compared to that of H_2 at 4.63 ppm. A theoretical rocketry propellant reaction is given that may be transformational.

35. R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Spectroscopic Characterization of the Atomic Hydrogen Energies and Densities and Carbon Species During Helium-Hydrogen-Methane Plasma CVD Synthesis of Single Crystal Diamond Films", Chemistry of Materials, Vol. 15, (2003), pp. 1313-1321.

Polycrystalline diamond films were synthesized on silicon substrates for the first time without diamond seeding by a very low power (38 W) microwave plasma continuous vapor deposition (MPCVD) reaction of a mixture of helium-hydrogen-methane (48.2/48.2/3.6%). The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA and Jobin Yvon Inc., Edison, NJ), scanning electron microscopy (SEM) (S. S. W., University of Western Ontario, Canada and Material Testing Laboratory, Pennington, NJ), and X-ray diffraction (XRD) (IC Laboratories, Amawalk, NY). It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. CH, C_2, and C_3 emissions were observed with significantly broadened H α, β, γ, and δ lines. The average hydrogen atom temperature of a helium-hydrogen-methane plasma was measured to be $120\text{-}140\,eV$ versus $\approx 3\,eV$ for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the CO tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

34. **R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Low Power MPCVD of Diamond Films on Silicon Substrates", Journal of Vacuum Science & Technology A, submitted.**

Polycrystalline diamond films were synthesized on silicon substrates for the first time without diamond seeding by a very low power (38 W) microwave plasma continuous vapor deposition (MPCVD) reaction of a mixture of 10-30% hydrogen, 90-70% helium, and 1-10% CH_4. The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA), scanning electron microscopy (SEM) (S. S. W., University of Western Ontario, Canada and Material Testing Laboratory, Pennington, NJ), and X-ray diffraction (XRD) (IC Laboratories, Amawalk, NY). It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. The average hydrogen atom temperature was measured to be $180\text{-}210\,eV$ versus $\approx 3\,eV$ for pure hydrogen. The electron

temperature T_e for helium-hydrogen was 28,000 K compared to 6800 K for pure helium. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the CO tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

33. **R. L. Mills, A. Voigt, B. Dhandapani, J. He, "Synthesis and Spectroscopic Identification of Lithium Chloro Hydride", Materials Characterization, submitted.**

A novel inorganic hydride compound, lithium chloro hydride ($LiHCl$), which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with potassium metal and lithium chloride. Lithium chloro hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), ^1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), and powder X-ray diffraction (IC Laboratories, Amawalk, NY). Hydride ions with increased binding energies may form many novel compounds with broad applications such as the oxidant of a high voltage battery.

32. **R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", Solar Energy Materials & Solar Cells, in press.**

A novel highly stable hydrogen terminated silicon coating was synthesized by microwave plasma reaction of mixture of silane, hydrogen, and helium wherein it is proposed that He^+ served as a catalyst with atomic hydrogen to form highly stable silicon hydrides. Novel silicon hydride was identified by time of flight secondary ion mass spectroscopy and X-ray photoelectron spectroscopy. The time of flight secondary ion mass spectroscopy (ToF-SIMS) identified the coatings as hydride by the large SiH^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. Since hydrogen is the only element with no primary element peaks, X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA) identified the H content of the SiH coatings as comprising novel silicon hydrides due to new peaks at 11, 43, and 55 eV in the absence of corresponding peaks of any candidate element at higher binding

energies. The silicon hydride surface was remarkably stable to air as shown by XPS. The highly stable amorphous silicon hydride coating may advance the production of integrated circuits and microdevices by resisting the oxygen passivation of the surface and possibly altering the dielectric constant and band gap to increase device performance.

31. **R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Synthesis of HDLC Films from Solid Carbon", Thin Solid Films, submitted.**

Diamond-like carbon (DLC) films were synthesized on silicon substrates from solid carbon by a very low power (~60 W) microwave plasma chemical vapor deposition (MPCVD) reaction of a mixture of 90-70% helium and 10-30% hydrogen. It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. The average hydrogen atom temperature of a helium-hydrogen plasma was measured to be $180\text{-}210\,eV$ versus $\approx 3\,eV$ for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of DLC. The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), and Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA). TOF-SIMS identified the coatings as hydride by the large H^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. The XPS identification of the H content of the CH coatings as a novel hydride corresponding to a peak at 49 eV has implications that the mechanism of the DLC formation may also involve one or both of selective etching of graphitic carbon and the stabilization of sp^3-bonded carbon by the hydrogen catalysis product. Thus, a novel H intermediate formed by the plasma catalysis reaction may enhance the stabilization and etching role of H used in past methods.

30. **R. L. Mills, J. He, P. Ray, B. Dhandapani, X. Chen, "Synthesis and Characterization of a Highly Stable Amorphous Silicon Hydride as the Product of a Catalytic Helium-Hydrogen Plasma Reaction", Int. J. Hydrogen Energy, in press.**

A novel highly stable surface coating $SiH(1/p)$ which comprised high binding energy hydride ions was synthesized by a microwave plasma reaction of a mixture of silane, hydrogen, and helium wherein it is proposed that He^+ served as a catalyst with atomic

hydrogen to form the highly stable hydride ions. Novel silicon hydride was identified by time of flight secondary ion mass spectroscopy and X-ray photoelectron spectroscopy. The time of flight secondary ion mass spectroscopy (ToF-SIMS) identified the coatings as hydride by the large SiH^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA) identified the H content of the SiH coatings as hydride ions, $H^-(1/4)$, $H^-(1/9)$, and $H^-(1/11)$ corresponding to peaks at 11, 43, and 55 eV, respectively. The silicon hydride surface was remarkably stable to air as shown by XPS. The highly stable amorphous silicon hydride coating may advance the production of integrated circuits and microdevices by resisting the oxygen passivation of the surface and possibly altering the dielectric constant and band gap to increase device performance.

The plasma which formed $SiH(1/p)$ showed a number of extraordinary features. Novel emission lines with energies of $q \cdot 13.6\ eV$ where $q = 1,2,3,4,6,7,8,9,\ or\ 11$ were previously observed by extreme ultraviolet (EUV) spectroscopy recorded on microwave discharges of helium with 2% hydrogen [R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322]. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen where p is an integer, · formed by a resonant nonradiative energy transfer to He^+ acting as a catalyst. The average hydrogen atom temperature of the helium-hydrogen plasma was measured to be $180\text{-}210\ eV$ versus $\approx 3\ eV$ for pure hydrogen. Using water bath calorimetry, excess power was observed from the helium-hydrogen plasma compared to control krypton plasma. For example, for an input of 8.1 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 30.0 W corresponding to 21.9 W of excess power in 3 cm^3. The excess power density and energy balance were high, $7.3\ W/cm^3$ and $-2.9 X 10^4\ kJ/mole\,H_2$, respectively. This catalytic plasma reaction may represent a new hydrogen energy source and a new field of hydrogen chemistry.

29. **R. L. Mills, A. Voigt, B. Dhandapani, J. He, "Synthesis and Characterization of Lithium Chloro Hydride", Int. J. Hydrogen Energy, submitted.**

A novel inorganic hydride compound lithium chloro hydride, $LiHCl$, which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with

potassium metal and lithium chloride. Lithium chloro hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), ^1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), and powder X-ray diffraction (IC Laboratories, Amawalk, NY). Hydride ions with increased binding energies may form many novel compounds with broad applications such as the oxidant of a high voltage battery.

28. **R. Mills, E. Dayalan, P. Ray, B. Dhandapani, J. He, "Highly Stable Novel Inorganic Hydrides from Aqueous Electrolysis and Plasma Electrolysis", Electrochimica Acta, Vol. 47, No. 24, (2002), pp. 3909-3926.**

After 10^4 hours of continuous aqueous electrolysis with K_2CO_3 as the electrolyte, highly stable novel inorganic hydride compounds such as $KH\,KHCO_3$ and KH were isolated and identified by time of flight secondary ion mass spectroscopy (ToF-SIMS) (Charles Evans East, East Windsor, NJ). The existence of novel hydride ions was determined using X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA) and solid state magic-angle spinning ^1H nuclear magnetic resonance spectroscopy (^1H MAS NMR) (Spectral Data Services, Inc., Champaign, IL). A novel ion formed by plasma electrolysis of a K_2CO_3, Rb_2CO_3, or Cs_2CO_3 electrolyte was also observed by high resolution visible spectroscopy at 407.0 nm corresponding to its predicted binding energy of 3.05 eV.

27. **R. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", Int. J. Hydrogen Energy, Vol. 26, No. 9, Sept. (2001), pp. 965-979.**

Novel inorganic alkali and alkaline earth hydrides of the formula $MH*$, MH_2^*, and $MH*X$ wherein M is the metal, X, is a halide, and $H*$ comprises a novel high binding energy hydride ion were synthesized in a high temperature gas cell by reaction of atomic hydrogen with a catalyst and MH, MH_2, or MX corresponding to an alkali metal or alkaline earth metal compound, respectively. Novel hydride ions of the corresponding novel hydride compounds were characterized by an extraordinary upfield shifted peak observed by ^1H nuclear magnetic resonance spectroscopy. The result were confirmed on five different

instruments at five independent laboratories (Spectral Data Services, Inc., Champaign, IL, National Research Council of Canada, University of Massachusetts Amherst, Amherst, MA, University of Delaware, Wilmington, DE, and Grace Davison, Columbia, MD).

26. **R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1185-1203.**

A novel inorganic hydride compound KHI which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with potassium metal and potassium iodide. Potassium iodo hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), ^1H and ^{39}K nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), Fourier transform infrared spectroscopy (Surface Science Laboratories, Mountain View, CA), electrospray ionization time of flight mass spectroscopy (Perkin-Elmer Biosystems, Framingham, MA), liquid chromatography/mass spectroscopy (Ricerca, Inc., Painesville, Ohio), thermal decomposition with analysis by gas chromatography, and mass spectroscopy, and elemental analysis (Galbraith Laboratories, Inc., Knoxville, TN). Hydride ions with increased binding energies may form many novel compounds with broad applications.

25. **R. Mills, "Novel Inorganic Hydride", Int. J. of Hydrogen Energy, Vol. 25, (2000), pp. 669-683.**

A novel inorganic hydride compound $KH\,KHCO_3$ which is stable in water and comprises a high binding energy hydride ion was isolated following the electrolysis of a K_2CO_3 electrolyte. Inorganic hydride clusters $K[KH\,KHCO_3]_n^+$ were identified by Time of Flight Secondary Ion Mass Spectroscopy (Charles Evans East, East Windsor, NJ). Moreover, the existence of a novel hydride ion has been determined using X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), and ^1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL). Hydride ions with increased binding energies may be the basis of a high voltage battery for electric vehicles.

24. R. Mills, B. Dhandapani, M. Nansteel, J. He, T. Shannon, A. Echezuria, "Synthesis and Characterization of Novel Hydride Compounds", Int. J. of Hydrogen Energy, Vol. 26, No. 4, (2001), pp. 339-367.

Novel inorganic alkali and alkaline earth hydrides of the formula MHX and $MHMX$ wherein M is the metal, X, is a singly negatively charged anion, and H comprises a novel high binding energy hydride ion were synthesized in a high temperature gas cell by reaction of atomic hydrogen with a catalyst and MX or MX_2 corresponding to an alkali metal or alkaline earth metal, respectively. It has been reported that intense extreme ultraviolet (EUV) emission was observed at low temperatures (e.g. $\approx 10^3 \ K$) from atomic hydrogen and certain atomized elements or certain gaseous ions which ionize at integer multiples of the potential energy of atomic hydrogen, $27.2 \ eV$ [1-5]. These atomized elements or certain gaseous ions comprised the catalyst to form MHX and $MHMX$. For example, atomic hydrogen was reacted with strontium vapor and $SrBr_2$ to form $SrHBr$. Novel hydride compounds such as $SrHBr$ were identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), ^1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), and thermal decomposition with analysis by gas chromatography, and mass spectroscopy. Hydride ions with increased binding energies form novel compounds with potential broad applications such as a high voltage battery for consumer electronics and electric vehicles. In addition, these novel compositions of matter and associated technologies may have far-reaching applications in many industries including chemical, electronics, computer, military, energy, and aerospace in the form of products such as propellants, solid fuels, surface coatings, structural materials, and chemical processes.

23. R. Mills, "Highly Stable Novel Inorganic Hydrides", Journal of New Materials for Electrochemical Systems, Vol. 6, (2003), pp. 45-54.

Novel inorganic hydride compounds $KHKHCO_3$ and KH were isolated following the electrolysis of a K_2CO_3 electrolyte. The compounds which comprised high binding energy hydride ions were stable in water, and KH was stable at elevated temperature (600 °C). Inorganic hydride clusters $K[KHKHCO_3]_n^+$ were identified by positive Time of Flight Secondary Ion Mass Spectroscopy (ToF-SIMS) of $KHKHCO_3$ (Charles Evans East, East

<u>Windsor, NJ</u>). The negative ToF-SIMS was dominated by hydride ion. The positive and negative ToF-SIMS of KH showed essentially K^+ and H^- only, respectively. Moreover, the existence of novel hydride ions was determined using X-ray photoelectron spectroscopy (<u>Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA</u>), and ^1H nuclear magnetic resonance spectroscopy (<u>Spectral Data Services, Inc., Champaign, IL</u>). Hydride ions with increased binding energies may be the basis of a high voltage battery for electric vehicles.

22. **R. Mills, "Novel Hydrogen Compounds from a Potassium Carbonate Electrolytic Cell", Fusion Technology, Vol. 37, No. 2, March, (2000), pp. 157-182.**

Novel compounds containing hydrogen in new hydride and polymeric states which demonstrate novel hydrogen chemistry have been isolated following the electrolysis of a K_2CO_3 electrolyte with the production of excess energy. Inorganic hydride clusters $K[KH\ KHCO_3]_n^+$ and hydrogen polymer ions such as OH_{23}^+ and H_{16}^- were identified by time of flight secondary ion mass spectroscopy (<u>Charles Evans East, East Windsor, NJ</u>). The presence of compounds containing new states of hydrogen were confirmed by X-ray photoelectron spectroscopy (<u>Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA</u>), X-ray diffraction, Fourier transform infrared spectroscopy (<u>Surface Science Laboratories, Mountain View, CA</u>), Raman spectroscopy (<u>Environmental Catalysis and Materials Laboratory of Virginia Polytechnic Institute</u>), and ^1H nuclear magnetic resonance spectroscopy (<u>Spectral Data Services, Inc., Champaign, IL</u>).

21. **Mills, R., Good, W., "Fractional Quantum Energy Levels of Hydrogen", Fusion Technology, Vol. 28, No. 4, November, (1995), pp. 1697-1719.**

Determination of excess heat release during the electrolysis of aqueous potassium carbonate by the very accurate and reliable method of heat measurement, flow calorimetry; describes the experimental identification of hydrogen atoms in fractional quantum energy levels—hydrinos—by X-ray Photoelectron Spectroscopy (XPS) (<u>Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA</u>); describes the experimental identification of hydrogen atoms in fractional quantum energy levels—hydrinos—by emissions of soft X-rays from dark matter; describes the experimental identification of hydrogen molecules in fractional quantum energy levels—dihydrino

molecules by high resolution magnetic sector mass spectroscopy with ionization energy determination, and gives a summary.

In summary:

Excess power and heat were observed during the electrolysis of aqueous potassium carbonate. Flow calorimetry of pulsed current electrolysis of aqueous potassium carbonate at a nickel cathode was performed in a single-cell dewar. The average power out of 24.6 watts exceeded the average input power (voltage times current) of 4.73 watts by a factor greater than 5. The total input energy (integration of voltage times current) over the entire duration of the experiment was 5.72 MJ; whereas, the total output energy was 29.8 MJ. No excess heat was observed when the electrolyte was changed from potassium carbonate to sodium carbonate. The source of heat is assigned to the electrocatalytic, exothermic reaction whereby the electrons of hydrogen atoms are induced to undergo transitions to quantized energy levels below the conventional "ground state". These lower energy states correspond to fractional quantum numbers: $n = 1/2, 1/3, 1/4, \ldots$. Transitions to these lower energy states are stimulated in the presence of pairs of potassium ions (K^+/K^+ electrocatalytic couple) which provide 27.2 eV energy sinks.

The identification of the $n = 1/2$ hydrogen atom , $H(n = 1/2)$ is reported. Samples of the nickel cathodes of aqueous potassium carbonate electrolytic cells and aqueous sodium carbonate electrolytic cells were analyzed by XPS (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA). A broad peak centered at 54.6 eV was present only in the cases of the potassium carbonate cells. The binding energy (in vacuum) of $H(n = 1/2)$ is 54.4 eV. Thus, the theoretical and measured binding energies for $H(n = 1/2)$ are in excellent agreement.

Further experimental identification of hydrinos—down to $H(n = 1/8)$—can be found in the alternative explanation by Mills et al. for the soft X-ray emissions of the dark interstellar medium observed by Labov and Bowyer [Labov, S., Bowyer, S., "Spectral observations of the extreme ultraviolet background", The Astrophysical Journal, 371, (1991), pp. 810-819] of the Extreme UV Center of the University of California, Berkeley. The agreement between the experimental spectrum and the energy values predicted for the proposed transitions is remarkable.

The reaction product of two H(n=1/2) atoms, the dihydrino molecule, was identified by mass spectroscopy (Shrader Analytical & Consulting Laboratories). The mass spectrum of the cryofiltered gases evolved during the electrolysis of a light water K_2CO_3 electrolyte with a nickel cathode demonstrated that the dihydrino molecule, $H_2\left(n = \dfrac{1}{2}\right)$, has a higher ionization energy, about 63 eV, than normal molecular hydrogen, $H_2(n = 1)$, 15.46 eV. The high resolution (0.001 AMU) magnetic sector mass spectroscopic analysis of the postcombustion gases indicated the presence of two peaks of nominal mass two-- one peak at 70 eV and one peak at 25 eV. The same analysis of molecular hydrogen indicates only one peak at 25 eV and one peak at 70 eV. In the case of the postcombustion sample at 70 eV, one peak was assigned as the hydrogen molecular ion peak, $H_2^+(n = 1)$, and one peak was assigned as the dihydrino molecular peak, $H_2^+\left(n = \dfrac{1}{2}\right)$ which has a slightly larger magnetic moment.

20. **Mills, R., Good, W., Shaubach, R., "Dihydrino Molecule Identification", Fusion Technology, Vol. 25, 103 (1994).**

Calorimetry of pulsed current and continuous electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) at a nickel cathode was performed by Thermacore, Inc., Lancaster, PA. The excess power out of 41 watts exceeded the total input power given by the product of the electrolysis voltage and current by a factor greater than 8. Elemental analysis of the electrolyte and metallurgical analysis of the cathode showed no evidence of chemical reactions. The pH, specific gravity, concentration of K_2CO_3, and the elemental analysis of the electrolyte sample taken after 42 days of continuous operation were unchanged from that of the values obtained for the electrolyte sample taken before operation. Elemental analysis and scanning electron microscopy of metallurgical samples of the nickel cathode taken before operation and at day 56 of continuous operation were identical indicating that the nickel cathode had not changed chemically or physically. Scintillation counter and photographic film measurements showed that no radiation above background was detected indicating that nuclear reactions did not occur.

The "ash" of the exothermic reaction is atoms having electrons of energy below the "ground state" which are predicted to form molecules. The predicted molecules were identified by lack of reactivity with oxygen, by separation from molecular deuterium by

cryofiltration, and by mass spectroscopic analysis. The combustion of the gases evolved during the electrolysis of a light water K_2CO_3 electrolyte (K^+/K^+ electrocatalytic couple) with a nickel cathode was incomplete. The mass spectroscopic analysis (Dr. David Parees of Air Products & Chemicals, Inc.) of the m/e = 2 peak of the combusted gas demonstrated that the dihydrino molecule, $H_2(n = 1/2)$, has a higher ionization energy than H_2.

Calorimetry of pulsed current and continuous electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) at a nickel cathode was performed in single cell dewar calorimetry cells by HydroCatalysis Power Corporation. Excess power out exceeded input power by a factor greater than 16. No excess heat was observed when the electrolyte was changed from potassium carbonate to the control sodium carbonate. The faraday efficiency was measured volumetrically to be 100%.

19. V. Noninski, Fusion Technol., Vol. 21, 163 (1992).

Dr. Noninski of the Laboratory for Electrochemistry of Renewed Electrode-Solution Interface (LEPGER) successfully reproduced the results of Mills and Kneizys [R. Mills and S. Kneizys, Fusion Technol. Vol. 20, 65 (1991)] as a visiting professor at Franklin and Marshall College. A significant increase in temperature with every watt input, compared with the calibration experiment ($\approx 50 \ °C / W$ versus $\approx 30 \ °C / W$), was observed during the electrolysis of potassium carbonate. This effect was not observed when sodium carbonate was electrolyzed. No trivial explanation (in terms of chemical reactions, change in heat transfer properties, etc.) of this effect were found.

18. Niedra, J., Meyers, I., Fralick, G. C., and Baldwin, R., "Replication of the Apparent Excess Heat Effect in a Light Water-Potassium Carbonate-Nickel Electrolytic Cell, NASA Technical Memorandum 107167, February, (1996). pp. 1-20.; Niedra, J., Baldwin, R., Meyers, I., NASA Presentation of Light Water Electrolytic Tests, May 15, 1994.

NASA Lewis tested a cell identical to that of Thermacore [Mills, R., Good, W., Shaubach, R., "Dihydrino Molecule Identification", Fusion Technology, Vol. 25, 103 (1994)] with the exception that it was minus the central cathode. A cell identical to the test cell with heater power only (no electrolysis) was the calibration control and the blank cell with the heater power equal to zero. The test cell was also calibrated "on the fly" by measuring the

temperature relative to the blank cell at several values of heater input power of the test cell. "Replication of experiments claiming to demonstrate excess heat production in light water-Ni-K_2CO_3 electrolytic cells was found to produce an apparent excess heat of 11 W maximum, for 60 W electrical power into the cell. Power gains ranged from 1.06 to 1.68." The production of excess energy with a power gain of 1.68 would require 0% Faraday efficiency to account for the observed excess power.

17. **Technology Insights, 6540 Lusk Boulevard, Suite C-102, San Diego, CA 92121, "HydroCatalysis Technical Assessment Prepared for PacifiCorp", August 2, 1996.**

This report documents a technical assessment of a novel source of hydrogen energy advanced by HydroCatalysis Power Corporation now BlackLight Power, Inc. (BLP). The assessment was conducted as part of the due diligence performed for PacifiCorp. It was conducted by a literature search and review, site visits to BLP and collaborating organizations, and telephone interviews with others active in the general area. A description of concept is provided in Section 3. Section 4 presents an assessment of the concept background, supporting theory, laboratory prototypes, projected initial products, and economic and environmental aspects. Section 5 documents the results of telephone interviews and site visits. An overall summary and conclusions are presented in the following section.

16. **P. M. Jansson, "HydroCatalysis: A New Energy Paradigm for the 21st Century", Thesis Submitted in partial fulfillment of the requirements of the Masters of Science in Engineering Degree in the Graduate Division of Rowan University, May 1997, Thesis Advisors: Dr. J. L. Schmalzel, Dr. T. R. Chandrupatla, and Dr. A. J. Marchese, External Advisors: Dr. J. Phillips, Pennsylvania State University, Dr. R. L. Mills, BlackLight Power, Inc., W. R. Good, BlackLight Power, Inc.**

This thesis reviews the problems of worldwide energy supply, describes the current technologies that meet the energy needs of our industrial societies, summarizes the environmental impacts of those fuels and technologies and their increased use by a growing global and increasing technical economy. The work also describes and advances the technology being developed by BlackLight Power, Inc. (BLP) a scientific company located in Princeton, New Jersey. BLP's technology proports to offer commercially viable and useful

heat generation via a previously unrecognized natural phenomenon - the catalytic reduction of the hydrogen atom to a lower energy state. Laboratory tests obtained as original research of this thesis as well as the review of the data of others substantiate the fact that replication of the experimental conditions which are favorable to initiating and sustaining the new energy release process will generate controllable, reproducible, sustainable and commercial meaningful heat. For example, Jansson has determined heat production associated with hydrino formation with a Calvet calorimeter which yielded exceptional results. Specifically, the results are completely consistent with Mills hydrino formation hypothesis. Approximately 10^{-3} moles of hydrogen was admitted to a 20 cm^3 Calvet cell containing a heated platinum filament and KNO_3 powder. In the three separate trials with a platinum filament hydrogen dissociator which was varied in length of 10 cm, 20 cm, and 30 cm, a mean power of 0.581, 0.818, and 1.572 watts was observed, respectively. The closed experiments were run to completion. The energy observed was 622, 369, and 747 kJ, respectively, This is equivalent to the generation of $6.2 \times 10^8 \, J/mole$, $3.7 \times 10^8 \, J/mole$, and $7.5 \times 10^8 \, J/mole$ of hydrogen, respectively, as compared to $2.5 \times 10^5 \, J/mole$ of hydrogen anticipated for standard hydrogen combustion. Thus, the total heats generated appear to be at least 1000 times too large to be explained by conventional chemistry, but the results are completely consistent with Mills model. Convincing evidence is presented to lead to the conclusion that BLP technology has tremendous potential to achieve commercialization and become an energy paradigm for the next century. The research was also conducted as part of the due diligence performed for Atlantic Energy now Conectiv.

15. **Phillips, J., Smith, J., Kurtz, S., "Report On Calorimetric Investigations Of Gas-Phase Catalyzed Hydrino Formation" Final report for Period October-December 1996", January 1, 1997, A Confidential Report submitted to BlackLight Power, Inc. provided by BlackLight Power, Inc., Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355.**

Pennsylvania State University Chemical Engineering Department has determined heat production associated with hydrino formation with a Calvet calorimeter which yielded exceptional results. Specifically, the results are completely consistent with Mills hydrino formation hypothesis. In three separate trials, between 10 and 20 K Joules were generated at a rate of 0.5 Watts, upon admission of approximately 10^{-3} moles of hydrogen to the 20

cm^3 Calvet cell containing a heated platinum filament and KNO_3 powder. This is equivalent to the generation of $10^7 \, J/mole$ of hydrogen, as compared to $2.5 \, X \, 10^5 \, J/mole$ of hydrogen anticipated for standard hydrogen combustion. Thus, the total heats generated appear to be 100 times too large to be explained by conventional chemistry, but the results are completely consistent with Mills model.

14. **Phillips, J., Shim, H., "Additional Calorimetric Examples of Anomalous Heat from Physical Mixtures of K/Carbon and Pd/Carbon", January 1, 1996, A Confidential Report submitted to HydroCatalysis Power Corporation provided by HydroCatalysis Power Corporation, Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355.**

Pennsylvania State University Chemical Engineering Department has determined excess heat release from flowing hydrogen in the presence of ionic hydrogen spillover catalytic material: 40% by weight potassium nitrate (KNO_3) on graphitic carbon powder with 5% by weight 1%-Pd-on-graphitic carbon (K^+/K^+ electrocatalytic couple) by the very accurate and reliable method of heat measurement, thermopile conversion of heat into an electrical output signal. Excess power and heat were observed with flowing hydrogen over the catalyst. However, no excess power was observed with flowing helium over the catalyst mixture. Rates of heat production were reproducibly observed which were higher than that expected from the conversion of all the hydrogen entering the cell to water, and the total energy observed was over four times larger than that expected if all the catalytic material in the cell were converted to the lowest energy state by "known" chemical reactions. Thus, "anomalous" heat, heat of a magnitude and duration which could not be explained by conventional chemistry, was reproducibly observed.

13. **Bradford, M. C., Phillips, J., "A Calorimetric Investigation of the Reaction of Hydrogen with Sample PSU #1", September 11, 1994, A Confidential Report submitted to HydroCatalysis Power Corporation provided by HydroCatalysis Power Corporation, Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355.**

Pennsylvania State University Chemical Engineering Department has determined excess heat release from flowing hydrogen in the presence of nickel oxide powder containing

strontium niobium oxide (Nb^{3+}/Sr^{2+} electrocatalytic couple) by the very accurate and reliable method of heat measurement, thermopile conversion of heat into an electrical output signal. Excess power and heat were observed with flowing hydrogen over the catalyst which increased with increasing flow rate. However, no excess power was observed with flowing helium over the catalyst/nickel oxide mixture or flowing hydrogen over nickel oxide alone. Approximately 10 cc of nickel oxide powder containing strontium niobium oxide immediately produced 0.55 W of steady state output power at 523 K. When the gas was switched from hydrogen to helium, the power immediately dropped. The switch back to hydrogen restored the excess power output which continued to increase until the hydrogen source cylinder emptied at about the 40,000 second time point. With no hydrogen flow the output power fell to zero.

The source of heat is assigned to the electrocatalytic, exothermic reaction whereby the electrons of hydrogen atoms are induced to undergo transitions to quantized energy levels below the conventional "ground state". These lower energy states correspond to fractional quantum numbers: $n = 1/2, 1/3, 1/4, \dots$. Transitions to these lower energy states are stimulated in the presence of pairs of niobium and strontium ions (Nb^{3+}/Sr^{2+} electrocatalytic couple) which provide 27.2 eV energy sinks.

12. **Jacox, M. G., Watts, K. D., "The Search for Excess Heat in the Mills Electrolytic Cell", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, January 7, 1993.**

Idaho National Engineering Laboratory (INEL) operated a cell identical to that of Thermacore [Mills, R., Good, W., Shaubach, R., "Dihydrino Molecule Identification", Fusion Technology, Vol. 25, 103 (1994)] except that it was minus the central cathode and that the cell was wrapped in a one-inch layer of urethane foam insulation about the cylindrical surface. The cell was operated in a pulsed power mode. A current of 10 amperes was passed through the cell for 0.2 seconds followed by 0.8 seconds of zero current for the current cycle. The cell voltage was about 2.4 volts, for an average input power of 4.8 W. The electrolysis power average was 1.84 W, and the stirrer power was measured to be 0.3 W. Thus, the total average net input power was 2.14 W. The cell was operated at various resistance heater settings, and the temperature difference between the cell and the ambient as well as the heater power were measured. The results of the excess power as a function

of cell temperature with the cell operating in the pulsed power mode at 1 Hz with a cell voltage of 2.4 volts, a peak current of 10 amperes, and a duty cycle of 20 % showed that the excess power is temperature dependent for pulsed power operation, and the maximum excess power was 18 W for an input electrolysis joule heating power of 2.14 W. Thus, the ratio of excess power to input electrolysis joule heating power was 850 %. INEL scientists constructed an electrolytic cell comprising a nickel cathode, a platinized titanium anode, and a 0.57 M K_2CO_3 electrolyte. The cell design appears in Appendix 1. The cell was operated in the environmental chamber in the INEL Battery Test Laboratory at constant current, and the heat was removed by forced air convection in two cases. In the first case, the air was circulated by the environmental chamber circulatory system alone. In the second case, an additional forced air fan was directed onto the cell. The cell was equipped with a water condenser, and the water addition to the cell due to electrolysis losses was measured. The data of the forced convection heat loss calorimetry experiments during the electrolysis of a 0.57 M K_2CO_3 electrolyte with the INEL cell showed that 13 W of excess power was produced. This excess power could not be attributed to recombination of the hydrogen and oxygen as indicated by the equivalence of the calculated and measured water balance.

11. Peterson, S., H., Evaluation of Heat Production from Light Water Electrolysis Cells of HydroCatalysis Power Corporation, Report from Westinghouse STC, 1310 Beulah Road, Pittsburgh, PA, February 25, 1994.

Westinghouse Electric Corporation reports that excess heat was observed during the electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) where the electrolysis of aqueous sodium carbonate served as the control. The data of the temperature of the cell minus the ambient temperature shows that when potassium carbonate replaced sodium carbonate in the same cell with the same input electrolysis power, the potassium experiment was twice as hot as the sodium carbonate experiment for the duration of the experiment, one month. The net faraday efficiency of gas evolution was experimentally measured to be unity by weighing the experiment to determine that the expected rate of water consumption was observed. The output power exceeded the total input power. The data was analyzed by HydroCatalysis Power Corporation [Mills, R., Analysis by HydroCatalysis Power Corporation of Westinghouse Report Entitled "Evaluation of Heat

Production from Light Water Electrolysis Cells of HydroCatalysis Power Corporation, Report from Westinghouse STC", February 25, 1994].

10. **Haldeman, C. W., Savoye, G. W., Iseler, G. W., Clark, H. R., MIT Lincoln Laboratories Excess Energy Cell Final report ACC Project 174 (3), April 25, 1995.**

During the electrolysis of aqueous potassium carbonate, researchers working at MIT Lincoln Laboratories observed long duration excess power of 1-5 watts with output/input ratios over 10 in some cases with respect to the cell input power reduced by the enthalpy of the generated gas. In these cases, the output was 1.5 to 4 times the integrated volt-ampere power input. Faraday efficiency was measured volumetrically by direct water displacement.

9. **Craw-Ivanco, M. T.; Tremblay, R. P.; Boniface, H. A.; Hilborn, J. W.; "Calorimetry for a Ni/K_2CO_3 Cell", Atomic Energy Canada Limited, Chemical Engineering Branch, Chalk River Laboratories, Chalk River, Ontario, June 1994.**

Atomic Energy Canada Limited, Chalk River Laboratories, report that 128 % and 138% excess heat were observed in separate experiments by flow calorimetry during the electrolysis of aqueous potassium carbonate (K+/K+ electrocatalytic couple) in a closed cell, and that 138% was observed in an open cell.

8. **Shaubach, R. M., Gernert, N. J., "Anomalous Heat From Hydrogen in Contact with Potassium Carbonate", Thermacore Report, March 1994.**

A high temperature/high pressure/high power density industrial prototype gas cell power generator which produced 50 watts of power at 300 °C having a nickel surface area of only 300 cm^2 was successfully developed. A sample of the nickel tubing of the aqueous potassium carbonate permeation cell was analyzed by XPS at the Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA. A broad peak centered at 54.6 eV was present; whereas, the control nickel tube showed no feature. The binding energy (in vacuum) of H(n = 1/2) is 54.4 eV. Thus, the theoretical and measured binding energies for H(n = 1/2) are in excellent agreement. No excess energy or 54.6 eV feature were observed when sodium carbonate replaced potassium carbonate.

7. **Gernert, N., Shaubach, R. M., Mills, R., Good, W., "Nascent Hydrogen: An Energy Source," Final Report prepared by Thermacore, Inc., for the Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base, Contract Number F33615-93-C-2326, May, (1994).**

In a report prepared for the Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base, Thermacore reports, "anomalous heat was observed from a reaction of atomic hydrogen in contact with potassium carbonate on a nickel surface. The nickel surface consisted of 500 feet of 0.0625 inch diameter tubing wrapped in a coil. The coil was inserted into a pressure vessel containing a light water solution of potassium carbonate. The tubing and solution were heated to a steady state temperature of 249 °C using an I^2R heater. Hydrogen at 1100 psig was applied to the inside of the tubing. After the application of hydrogen, a 32 °C increase in temperature of the cell was measured which corresponds to 25 watts of heat. Heat production under these conditions is predicted by the theory of Mills where a new species of hydrogen is produced that has a lower energy state than normal hydrogen. ESCA analysis, done independently by Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, have found the predicted 55 eV signature of this new species of hydrogen."

6. **Wiesmann, H., Brookhaven National Laboratory, Department of Applied Science, Letter to Dr. Walter Polansky of the Department of Energy Regarding Excess Energy Verification at Brookhaven National Laboratory, October 16, 1991.**

Calorimetry of continuous electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) at a nickel cathode was performed in single cell dewar calorimetry cell by Noninski at Brookhaven National Laboratory. Dr. Weismann observed the experiment and reported the results to Dr. Walter Polansky of the U. S. Department of Energy. Dr. Weismann reports, "The claim is as follows. The temperature rise in the dewar is greater in the case of electrolysis as compared to using a resistor, even though the power dissipated is equal in both cases. According to Dr. Mills' theory, this apparent "excess power" is due to the fact that the electron in a hydrogen atom can "decay" to stable subinterger quantum levels. Dr. Noninski demonstrated this thermal effect at BNL." The observed rise in

temperature for a given input power was twice as high comparing electrolysis versus heater power.

5. Nesterov, S. B., Kryukov, A. P., Moscow Power Engineering Institute Affidavit, February, 26,1993.

The Moscow Power Engineering Institute experiments showed 0.75 watts of heat output with only 0.3 watts of total power input (power = VI) during the electrolysis of an aqueous potassium carbonate electrolyte with a nickel foil cathode and a platinized titanium anode. Excess power over the total input on the order of 0.45 watts was produced reliably and continuously over a period of three months. Evaluation of the electrolyte after three months of operation showed no significant change in its density or molar concentration. The cell was disassembled and inspected after over one month of operation at 0.1 amperes. This inspection showed no visible signs of a reaction between the electrodes and the electrolyte. The cell was re-assembled and operated as before. Excess energy was produced for the three month duration of the experiment. Scintillation counter measurements showed no signs of radiation external to the cell.

4. Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University Bethlehem, PA, November 1993.

Samples of the nickel cathodes of aqueous potassium carbonate electrolytic cells and aqueous sodium carbonate electrolytic cells were analyzed by XPS by Miller and Simmons of the Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA. A broad peak centered at 54.6 eV was present only in the cases of the potassium carbonate cells. The binding energy (in vacuum) of H(n = 1/2) is 54.4 eV. Thus, the theoretical and measured binding energies for H(n = 1/2) are in excellent agreement. Lehigh University has conducted an extensive investigation of the cathodes from heat producing as well as those from control cells. Miller concludes that "I was unable to find any other elements on the surface that cause the feature. The persistent appearance of a spectral feature near the predicted binding energy for many of the electrodes used with a K electrolyte is an encouraging piece of evidence for the existence of the reduced energy state hydrogen".

3. **Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993.**

The Lehigh XPS results of a broad peak centered at 54.6 eV present only in the cases of the potassium carbonate cells [Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, November 1993] were confirmed at Idaho National Engineering Laboratory (INEL). Samples which demonstrated the feature as well as control electrodes were tested for the presence of trace amounts of impurities of the elements iron and lithium at a sensitivity level of greater than 1000 times that of XPS. TOF-SIMS (Time of Flight-Secondary Ion Mass Spectroscopy) and XPS analysis of the nickel surface was performed by Charles Evans & Associates, Sunnyvale, CA [Lee, Jang-Jung, Charles Evans & Associates Time-Of-Flight Secondary Ion Mass Spectroscopy (TOF-SIMS) Surface Analysis Report, CE&A Number 40150, March 18, 1994]. The 54.6 eV feature was also observed by Charles Evans & Associates in the case of cathodes of potassium carbonate electrolytic cells [Craig, A., Y., Charles Evans & Associates XPS/ESCA Results, CE&A Number 44545, November 3, 1994]. Iron and lithium were the only remaining atoms which were in question by Lehigh University and INEL as the source of the 54.6 eV XPS peak. The Charles Evans TOF-SIMS results demonstrate that iron and lithium were not the source of this peak.

2. **Lee, Jang-Jung, Charles Evans & Associates Time-Of-Flight Secondary Ion Mass Spectroscopy (TOF-SIMS) Surface Analysis Report, CE&A Number 40150, March 18, 1994.**

The Lehigh XPS results of a broad peak centered at 54.6 eV present only in the cases of the potassium carbonate cells [Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, November 1993] were confirmed at Idaho National Engineering Laboratory (INEL) [Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993]. Samples which demonstrated the feature as well as control electrodes were tested for the presence of trace amounts of impurities of the elements iron and lithium at a sensitivity level of greater than 1000 times that of XPS. TOF-SIMS (Time of Flight-Secondary Ion Mass

Spectroscopy) and XPS analysis of the nickel surface was performed by <u>Charles Evans &</u>
<u>Associates, Sunnyvale, CA</u>. The 54.6 eV feature was also observed by Charles Evans &
Associates in the case of cathodes of potassium carbonate electrolytic cells [Jacox, M. G.,
Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc.,
Idaho Falls, Idaho, 83415, November 1993]. Iron and lithium were the only remaining atoms
which were in question by Lehigh University and INEL as the source of the 54.6 eV XPS
peak. The Charles Evans TOF-SIMS results demonstrate that iron and lithium were not the
source of this peak.

1. **Craig, A., Y., Charles Evans & Associates XPS/ESCA Results, CE&A Number 44545,**
   November 3, 1994.

The Lehigh XPS results of a broad peak centered at 54.6 eV present only in the cases
of the potassium carbonate cells [Miller, A., Simmons, G., Lehigh X-Ray Photoelectron
Spectroscopy Report, <u>Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh</u>
<u>University, Bethlehem, PA</u>, November 1993] were confirmed at <u>Idaho National Engineering</u>
<u>Laboratory</u> (INEL) [Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National
Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993].
Samples which demonstrated the feature as well as control electrodes were tested for the
presence of trace amounts of impurities of the elements iron and lithium at a sensitivity level
of greater than 1000 times that of XPS. TOF-SIMS (Time of Flight-Secondary Ion Mass
Spectroscopy) and XPS analysis of the nickel surface was performed by <u>Charles Evans &</u>
<u>Associates, Sunnyvale, CA</u> [Lee, Jang-Jung, Charles Evans & Associates Time-Of-Flight
Secondary Ion Mass Spectroscopy (TOF-SIMS) Surface Analysis Report, CE&A Number
40150, March 18, 1994]. The 54.6 eV feature was also observed by Charles Evans &
Associates in the case of cathodes of potassium carbonate electrolytic cells. Iron and lithium
were the only remaining atoms which were in question by Lehigh University and INEL as the
source of the 54.6 eV XPS peak. The Charles Evans TOF-SIMS results demonstrate that
iron and lithium were not the source of this peak.

Given Applicant's full compliance with the newest standard imposed by Specialist
McGinty during the February 11, 2003 Interview, which required independent validation

of the experimental evidence of record, Applicant is entitled to have this evidence accepted as reliable and to have this and other Blacklight applications issue as patents.

Applicant's Response Documenting Examiner Langel's Reaffirmation of the Utility and Operability of Applicant's Novel Hydrogen Technology and His Subsequent Removal From Examining All BlackLight Cases

Pursuant to agreement (3) above, Applicant followed up with the submission of much of the above scientific evidence in two copending BlackLight applications by arranging an Interview with Examiner Langel, who was assigned to those cases. [U.S. Serial Nos. 09/110,678 ('678 application) and 09/362,693 ('693 application).] The express purpose of the Interview, held on April 14, 2003, was to review those two applications on a claim-by-claim basis to ensure that the scientific data presented adequately supported the scope of the claims. Examiner Langel expressed once again his view that the claims of the two applications were adequately supported by the data and, therefore, his willingness to allow those applications.

A detailed account of the discussions Applicant's counsel, Jeffrey Melcher and Jeffrey Simenauer, had with Examiner Langel during the April 14, 2003 Interview, and with Examiner Langel and his supervisor, SPE Stanley Silverman, during follow-up telephone Interviews were documented in Supplemental Responses filed in the '678 and '693 applications, comments from which are reproduced below. Based on the shocking revelations divulged during these discussions, Applicant must once again protest in the strongest terms possible the manner in which an anonymous group of PTO officials (i.e., the "Secret Committee") has mishandled the examination of BlackLight's patent applications relating to Applicant's novel hydrogen technology.

Counsel was particularly distressed to learn that, after Examiner Langel met with Supervisor Silverman to advocate allowing the '678 and '693 applications to issue as patents, his supervisor informed him that "allowance is not an option." Despite the Examiner's careful study of the overwhelming weight of the scientific data supporting allowance, his

supervisor further instructed him to "make it appear as if you have authority [to allow the applications] and that you are in favor of full rejection."

Understandably, Examiner Langel felt uneasy having been asked to make representations on the record that were not true. He explained that, "for moral and ethical reasons," he had no choice but to allow himself to be removed from examining all assigned BlackLight applications. Although Supervisor Silverman admitted that the removal decision had been made "partially by [him] and partially by others," he would not reveal who those "others" were.

Applicant strongly objects to Examiner Langel's removal under these egregious circumstances and demands that the PTO reinstate him immediately and allow BlackLight's applications to issue. The Secret Committee is duty bound to honor the representations and agreements made by Quality Assurance Specialist Douglas McGinty during the February 11, 2003 Interview, declaring that:

(1) Examiner Langel and the other Examiners of record have "full authority" to review the scientific data supporting lower energy states of hydrogen generated and furnished by independent third parties and, based on that review, to issue patents as deemed appropriate;

(2) Applicant should confer with the Examiners, either by telephone or in person, to review each assigned application on a claim-by-claim basis to ensure that the scientific data presented adequately supports the scope of the claims; and

(3) for those claims determined to be adequately supported by the data, a patent will issue; for any claims deemed to be inadequately supported, Applicant reserves the right to continue seeking that broader claim coverage in subsequent proceedings. [See March 6, 2003 Response filed in the '678 application]

It was precisely because of the many prior abuses that led to this short-lived "breakthrough" that U.S. Congressman David Wu sent his Senior Legislative Assistant, Ted Liu, to attend the February 11 Interview. Prior to the Interview, a senior PTO official

alleged to Mr. Liu that there was no "Secret Committee." At the Interview, Mr. Liu witnessed not only Specialist McGinty's representation that Examiner Langel had the authority to allow BlackLight's applications, but the Examiner's unequivocal statement that the applications were, in fact, allowable and that he was prepared to issue Applicant his patents right then and there. [See supra at pp. 45-46 and 54; and Attachment P]

Despite those representations, an anonymous group of PTO officials has now declared that allowance is not even an option in BlackLight's cases. Worse yet, this Secret Committee wants to leave the false impression on the record that Examiner Langel—and perhaps other Examiners of record too—has the authority to allow BlackLight's applications, but that he favors the rejection of claims over allowance.

In view of this unfortunate incident, Applicant is entitled to a complete accounting of events leading to Examiner Langel's removal, including identification of all persons involved in making that decision. In raising an objection to the removal with Supervisor Silverman, Applicant's counsel requested that he identify those decision-makers, but was told, "You figure it out!"

Counsel has now taken steps to do so and expressly reserves the right to further supplement the objections raised herein as additional facts come to light.

Detailed Account of the April 14, 2003 Interview and Subsequent Discussions

As stated above, the express purpose of the April 14 Interview was to review the scientific data generated and furnished by independent third parties identified in the March 6 Response that was filed in the '678 and '693 applications as supporting lower energy states of hydrogen and to ensure that the data adequately supported the scope of the claims to secure their allowance.

Applicant had no reason to suspect that this approach, as agreed to during the prior February 11 Interview, was about to be completely scrapped. During the Interview, Examiner Langel once again reaffirmed his long-held opinion that the

scientific data demonstrated the operability of Applicant's novel hydrogen technology, thus warranting patent protection. The Examiner's comments made clear that, prior to the interview, he had extensively reviewed Applicant's data, as well as the summary statements characterizing that data, appearing in the prior Responses filed in the '678 and '693 applications. Based on that review, Examiner Langel expressed several times during the Interview his willingness to allow those cases. Those views were confirmed by the Examiner in his summary of the interview, which stated that "[t]he participants presented data establishing the existence of lower-energy hydrogen." [See April 14, 2003 Interview Summary Form filed in the '678 and '693 applications (Attachment F).]

Examiner Langel, however, refrained from indicating allowance of any specific claims for two stated reasons. First, a few items of submitted data summarized in the March 6 Response inexplicably could not be located in the PTO files. [See April 14, 2003 Interview Summary Form in the '678 and '693 applications (Attachment F)] The Examiner wanted time to confirm the data had been made of record and Applicant's description of its relevance. Second, despite Specialist McGinty's representation at the February 11 Interview that Examiner Langel had full authority to review the data and to issue claims in this case, the Examiner explained that he needed to advise him and Supervisor Silverman of his intention to do so.

Examiner Langel then recalled a recent visit to his office by Group Director Jacqueline Stone informing him that he did not have authority to issue Notices of Allowance, or to otherwise give indications of allowance, in any BlackLight applications. Director Stone instructed Examiner Langel that he would need Specialist McGinty's permission before so indicating allowance.

Examiner Langel did, however, note that Supervisor Silverman and Specialist McGinty had agreed before the February 11, 2003 Interview to allow claims if Applicant could show that his submitted scientific data was generated by independent third parties. The Examiner reassured counsel that he would present to his superiors the

scientific data discussed at the April 14 Interview with a recommendation of allowance consistent with his past views.

Applicant's counsel agreed that it made sense to allow time for Examiner Langel to discuss the case with his superiors and for counsel to resubmit the few missing items of scientific data, whereupon arrangement was made to continue with the personal Interview on the following day, April 15th. That morning, however, counsel received a distressing telephone message from Examiner Langel informing him that the Interview had been canceled. The Examiner stated that Supervisor Silverman had removed him from the subject cases and that he was no longer assigned to any BlackLight applications.

Applicant's counsel immediately telephoned Examiner Langel for a further explanation of what had happened. The Examiner confirmed his removal following the meeting he had arranged with Supervisor Silverman to discuss the scientific data that had been the subject of the previous day's Interview and to advocate allowance of the claims in the two subject applications. Examiner Langel informed counsel that his supervisor refused to even look at the data and, in response to his recommendation of allowance, Supervisor Silverman told him "allowance is not an option." According to Examiner Langel he was then told: "make it appear as if you have authority [to allow the applications] and that you are in favor of full rejection."

Examiner Langel explained that, regrettably, he had no choice but to resign from further examination of BlackLight's applications. According to the Examiner, Supervisor Silverman gave him the option of staying on, "but not really—I could not go on like this." He explained that "for moral and ethical reasons," he could no longer continue to examine his assigned cases.

Alarmed by this sudden turn of events, counsel called Supervisor Silverman the following day, April 16th, to object to Examiner Langel's removal and to seek his reinstatement. Supervisor Silverman confirmed that Examiner Langel would no longer

be examining Blacklight's patent applications and that all cases were in the process of being consolidated and transferred to a new Examiner.

Counsel kindly requested that Supervisor Silverman explain why those cases were being transferred and who made that decision. He initially refused to discuss the matter, saying only that, "I am not going to be put on the stand and cross examined on this." Upon further prodding, Supervisor Silverman volunteered that "the decision was made partially by me and partially by others." He refused, however, to be more specific when asked to identify the "others" involved in the decision, stating "I am not going to discuss that. You can say that it was *my* decision."

Counsel then informed Supervisor Silverman of Applicant's intention to file the present objection to Examiner Langel's removal and to the consolidation and transfer of BlackLight's applications to a new Examiner. Counsel explained that Applicant had expended enormous amounts of time and money over a period of many years prosecuting BlackLight's patent applications before Examiner Langel and getting him up to speed on the claimed technology and the extensive scientific data confirming its operation. Counsel argued that it was unfair now to remove Examiner Langel and transfer all of BlackLight's cases to a new Examiner just to begin the process all over again. Supervisor Silverman would hear none of it, again stating, "I'm not going to discuss it."

Applicant's counsel made one last attempt to learn the identity of the other PTO officials responsible for taking that drastic action and their reasons for doing so. Supervisor Silverman again refused this request for information, snapping at counsel, "You figure it out!" Counsel then asked the Supervisor whom they might talk to so they could "figure it out" as he put it. Supervisor Silverman advised counsel, "Talk to whomever you want," but when asked whom specifically he had in mind, he again retorted, "I don't like to be cross-examined."

At the end of the conversation, Supervisor Silverman attempted to justify the PTO's extreme actions by claiming that it was in the "best interest" to transfer the

applications. But, when asked by counsel whose best interest was being served by the transfer, he refused to answer. Instead, Supervisor Silverman offered a stunning revelation that Applicant's novel hydrogen technology was "beyond Examiner Langel's technical expertise" and that all of the BlackLight cases would be consolidated and transferred to another examiner with "more technical expertise." He would not elaborate on who this new, more highly qualified Examiner might be.

Needless to say, at no time during the five years Applicant has been prosecuting his patent applications before Examiner Langel—who has over thirty years of Patent Office experience—did his technical expertise ever come into question. Indeed, throughout this lengthy prosecution, counsel has been impressed with the Examiner's in-depth knowledge of chemistry and physics, as well as other scientific principles, underlying Applicant's novel hydrogen technology. That Supervisor Silverman would now raise Examiner Langel's technical competence as an issue at this late stage of the prosecution only heightens Applicant's suspicions as to the real motivation for removing Examiner Langel.

Immediately following the conversation with Supervisor Silverman, counsel telephoned Examiner Langel one last time to apprise him of the situation and to thank him for his many years of service in examining BlackLight's applications. Examiner Langel expressed regret over his removal from those cases and confirmed that he had "learned a lot about [BlackLight's] technology." The Examiner also expressed surprise that his expertise was now being called into question.

Examiner Langel shared counsel's exasperation over the situation. Counsel asked him if he knew of any other instances in which a PTO Examiner had been instructed to represent that he had authority to allow an application when, in fact, he had no such authority, and that he favored rejecting claims when he actually wanted to allow them. The Examiner's exact words were: "I've never seen anything like it."

Neither has Applicant's counsel and, in view of these unique circumstances, Applicant must once again strenuously object to the abusive treatment to which his applications have been subjected.

Demand for Information and Redress

In view of the above circumstances, Applicant respectfully demanded that the Secret Committee provide certain information and redress, including:

(1) a full accounting of the facts and circumstances that led to the decision to remove Examiner Langel from examining BlackLight's applications and to transfer those cases to a new Examiner, including, but not limited to, identification of all persons involved in that decision;

(2) immediate reinstatement of Examiner Langel to his position as the Examiner of record in all BlackLight applications to which he had been previously assigned; and

(3) the issuance of all allowable BlackLight applications in accordance with the representations and agreements made at the February 11, 2003 Interview.

Applicant believes that the events documented above are highly relevant to the examination of the present application—even though those events involve a different Examiner—and must be addressed in this case. Applicant therefore repeats here the above-mentioned demands. Applicant reached agreements with the PTO during the February 11, 2003 Interview as to how it would conduct its examination of BlackLight's applications following the tumultuous prosecution history of these cases. It would be blatantly unfair for the PTO to now default on those agreements, whereby examination in this case reverts back to where Applicant's scientific evidence is wholly ignored on baseless theoretical grounds without applying reasonable patent standards. But this is precisely what was done in the present Office Action in direct contravention to the

Federal Circuit's expectation that the PTO would put proper safeguards in place to protect "the interests of the applicant including fair and expeditious further examination."

Other Office Actions filed in co-pending BlackLight applications also raise cause for concern in this case. For example, Examiner Kalafut's irrelevant argument in his Advisory Action dated April 2, 2003 filed in U.S. Serial No. 08/467,911, that "the present Examiner did not commit to any agreements during the interview" is disappointing to say the least. Applicant acknowledges that, to the best of his recollection, Examiner Kalafut, although present at the February 11 Interview, did not speak a word. As previously indicated, it was Specialist McGinty who led the Interview on behalf of the PTO and it was he who ultimately agreed to the terms under which examination of BlackLight's patent applications would proceed, which terms were expressly reduced to writing. For Examiner Kalafut, or any of the Examiners present at the Interview, to now attempt to distance themselves from that agreement on the absurd grounds that they did not personally commit to it during the Interview merely illustrates yet another example of the PTO's arbitrary and capricious approach to examining BlackLight's patent applications.

Applicant has successfully complied with each new patentability standard the Secret Committee has erected to bar him from receiving his patents. Applicant will continue those efforts, even despite the recent turn of events surrounding Examiner Langel's outrageous removal and the PTO's refusal to honor its agreements, which actions confirm the Committee's position that allowance is not an option in this or any other BlackLight application. Despite these setbacks, Applicant still will not be deterred from seeking the fair and expeditious examination of these cases to which he is entitled.

In view of the specific theory-based arguments set forth in the June 11 Office Action that avoid proper consideration of Applicant's experimental evidence, Applicant provides the following additional response:

Regarding the Secret Committee's reliance on Krieg and Zimmerman

The Secret Committee launches one of its theory-based attacks, beginning on page 6 of the Office Action, based on "[f]urther evidence against applicant's theory ... shown in the internet articles by Krieg and Zimmerman." The Committee's reliance on these articles is misplaced for several reasons, not the least of which is its citation to Dr. Zimmerman, whose involvement in BlackLight's affairs calls the Committee's actions further into question.

Aside from the fact that the PTO relies on non-peer reviewed materials posted to an internet chat group while, at the same time, requiring that Applicant's submitted materials be subjected to peer review—a double standard if there ever was one—the Secret Committee shows extreme bias and rather poor judgment in citing material from an arch cynic with a significant vested interest that he is openly protecting. Indeed, as Applicant pointed out above, Dr. Zimmerman has boasted of his efforts to sabotoge Applicant's patent rights. The PTO needs no reminding that Dr. Zimmerman is the former Chief Scientist for the U.S. State Department who published an Abstract of a proposed APS speech boasting how his Department and the Patent Office "have fought back with success" against BlackLight. It was Dr. Zimmerman, of course, who informed Applicant that his colleague, Dr. Robert Park—spokesman for BlackLight's competitor the American Physical Society (APS)—has communicated with a PTO contact he refers to as "Deep Throat" with access to confidential patent information. [See March 6, 2003 "Response" filed in App'n Ser. No. 09/110,678, pp. 4-5][104]

Applicant is deeply concerned that the PTO has continued its questionable practice of cooperating with Applicant's competitors, including Dr. Zimmerman and Dr. Park, in thwarting Applicant's patent rights. This concern is only bolstered by the citation to Dr. Zimmerman's non-peer-reviewed, unsubstantiated comments appearing

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[104] Having injected Dr. Zimmerman into this case, the PTO is constrained to address the issues raised in the March 6, 2003 Response (Tab C) relating to the efforts of Dr. Zimmerman and his APS colleagues—Dr. Park in particular—to sabotage Applicant's patent rights.

in a paper entitled, "An Analysis of Theoretical Flaws in So-Called Classical Quantum Mechanics and of Experimental Evidence against CQM." Dr. Zimmerman's copyright notice, prominently displayed on the front of the paper in question, makes clear:

> This entire article is copyright 2001 by Peter D. Zimmerman. No forwarding, reposting, copying, excerpting or direct quotation **whatsoever**, even for the purpose of reviews, or storage in any data base or storage system other than the HSG files on Yahoo.com or on the author's personal computer is permitted without the express written permission of the author.

© Peter D. Zimmerman, 2001. All rights reserved. [Emphasis in original.]

Applicant must assume that the PTO, an agency obviously well versed in intellectual property rights, would not have willfully violated the terms of Dr. Zimmerman's copyright notice. Thus, it must be presumed that the agency has been in contact with Dr. Zimmerman, at the very least to secure his permission to reproduce this paper, if not to secure his cooperation in others ways that continue to undermine Applicant's patent rights. Applicant is entitled to know the extent of those contacts and the nature of any communications between the PTO and either Dr. Zimmerman or his colleague Dr. Park.

Applicant further points out that the PTO has simply ignored Dr. Mills' extensive rebuttal comments to Dr. Zimmerman's paper that were posted in the same internet chat room that Dr. Zimmerman used to post his paper. Applicant provides a copy of those rebuttal comments and requests that the PTO fully consider Dr. Mills' comments with the same level of reliability accorded Dr. Zimmerman. [See Attachment I]

Finally, Applicant requests an cogent explanation why the PTO required that all materials in support of his discovery of lower-energy hydrogen be submitted for peer review and publication in qualified scientific journals when biased statements taken from Applicant's competitors are not subjected to the same scrutiny. The PTO's imposition of this obvious double standard merely highlights the arbitrary and capricious manner in which the PTO has handled this and other BlackLight applications.

The Secret Committee's reliance in the Krieg and Zimmerman articles is also suspect based on substantive grounds. For instance, QM does not provide a basis for a "ground state" of the hydrogen atom beyond an arbitrary definition as discussed previously:

80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Foundations of Physics, submitted.

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2003 Edition posted at www.blacklightpower.com; Chps. 35-37.

The flawed argument given by Krieg was originally by Feynman, whom Krieg fails to reference. Feynman is incorrect in his treatment of the HUP as a physical principle separate from the postulated SE since it arises purely mathematically from the SE. Feynman incorrectly uses the HUP to determine the momentum of the bound electron. Error in the momentum and position is not the same as the momentum and position as incorrectly asserted by Feynman. Furthermore, the angular momentum of the electron from the SE is zero, not $\hbar$ as incorrectly asserted by Feynman (even ignoring the factor of 2 error using the correct equation for the HUP). These inescapable facts invalidate the argument. A further failing is that according to the SE, the electron must go closer to the nucleus than the Bohr radius. The opposite is claimed by Feynman. In fact, the electron must exist in the nucleus since the wave function is a maximum there. Feynman is also incorrect about the HUP being a physical law that can not be avoided. An experimental method that avoids the HUP has been found, and the long held and taught view that the HUP is the physical basis of the wave-particle duality nature of the

electron has been experimentally disproved[105]. These are just an few of the fundament fatal flaws in the Feynman argument as given in

> 80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Foundations of Physics, submitted. The abstract follows:

Abstract

Recently published data showing that the Rydberg series extends to lower states in a catalytic plasma reaction [R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542] has implication for the theoretical basis of the stability of the hydrogen atom. The hydrogen atom is the only real problem for which the Schrödinger equation can be solved without approximations; however, it only provides three quantum numbers—not four, and inescapable disagreements between observation and predictions arise from the later postulated Dirac equation as well as the Schrödinger equation. Furthermore, unlike physical laws such as Maxwell's equations, it is always disconcerting to those that study quantum mechanics (QM) that the particle-wave equation and the intrinsic Heisenberg Uncertainty Principle (HUP) must be accepted without any underlying physical basis for fundamental observables such as the stability of the hydrogen atom in the first place. In this instance, a circular argument regarding definitions for parameters in the wave equation solutions and the Rydberg series of spectral lines replaces a first-principles-based prediction of those lines. It is shown that the quantum theories of Bohr, Schrodinger, and Dirac provide no intrinsic stability of the hydrogen atom based on physics. An old argument from Feynman based on the HUP is shown to be internally inconsistent and fatally flawed. This argument further brings to light the many inconsistencies and shortcomings of QM and the intrinsic HUP that have not been reconciled from the days of their inception. The issue of

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[105] See S. Durr, T. Nonn, G. Rempe, Nature, September 3, (1998), Vol. 395, pp. 33-37 with 5. R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183; 17. R. Mills, The Nature of Free Electrons in Superfluid Helium—a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory, Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096; 1. R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; July 2003 Edition posted at http://www.blacklightpower.com/bookdownload.shtml, Foreword and Chp 37.

stability to radiation needs to be resolved, and the solution may eliminate of some of the mysteries and intrinsic problems of QM.

In contrast to QM, Applicant's classical quantum mechanics (CQM) does provide that the electron is not in the nucleus and that there is a minimum energy state that is not infinite. From 1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; July 2003 Edition posted at www.blacklightpower.com where the references are those in this section:

NEW "GROUND" STATE

Hydrogen atoms can undergo transitions to energy states below the $n = 1$ state until the potential energy of the proton is converted to kinetic energy and total energy (the negative of the binding energy), and a state is formed which is stable to both radiation and nonradiative energy transfer. The potential energy V of the electron and the proton separated by the radial distance radius r_1 is,

$$V = \frac{-e^2}{4\pi\varepsilon_o r_1} \tag{5.72}$$

where the radius r_1 is the proton radius given by Eq. (28.1)

$$r_p = 1.3 \times 10^{-15}\, m \tag{5.73}$$

Substitution of Eq.(5.73) into Eq.(5.72) gives the total potential energy V of the electron and the proton

$$V = \frac{-e^2}{4\pi\varepsilon_o r_p} = 1.1 \times 10^6\, eV \tag{5.74}$$

In the present case of an inverse squared central field, the binding energy and the kinetic energy are each equal to one half the potential energy [18] in the electron frame, and the lab-frame relativistic correction is given by correcting the radius as given in the Special Relativistic Correction to the Ionization Energies section. The relativistic invariance of the magnetic moment μ_B and angular momentum $\hbar$ of the electron may be used to characterize the limiting $v = c$ case as shown in the Atoms and Molecules—Determination of Orbitsphere Radii, r_n section. Considering the consequences of special relativity, the size of a hydrogen atom in the true ground state is significantly larger than the size of a muonic atom and is limited not to be less than λ, the electron Compton wavelength bar,

$$\lambda' = r' = \frac{\hbar}{m_e c} = \alpha a_0 \tag{5.75a}$$

$$\lambda = r = \frac{\hbar}{\gamma^* m_e c} = \frac{\alpha a_0}{2\pi} = 6.14 \, X \, 10^{-14} m \tag{5.75b}$$

since the tangential electron velocity (Eq. (1.56)) is the speed of light at this radius. Eq. (1.56) and Eq. (1.223) gives the relationship between the electron speed and the speed of light which gives the limit on the quantum state p as

$$\frac{v}{c} = \alpha p Z \qquad p = 1,2,3... \tag{5.76}$$

With $Z = 1$, $p \leq 137$ due to the limiting speed of light. In Eq. (5.75a) λ' is the radius in the electron frame, and λ in Eq. (5.75b) is the radius in the laboratory frame according to Eq. (1.249). From Eq. (5.75b), the proton radius given by Eq. (5.73) can not reached.

Lorentzian transformations of special relativity apply for inertial frames moving at constant rectilinear relative velocity, and the relativistic correction applies only to the direction of relative motion, not the perpendicular direction. Mass in a circular orbit is constantly accelerating. As shown in the "SPACETIME FOURIER TRANSFORM OF THE ELECTRON FUNCTION" section and the Special Relativistic Correction to the Ionization Energies section, at light speed, in the laboratory inertial frame, there can be no motion transverse to the radius. The radial projection of the time harmonic motion of a point charge element of a great circle becomes equivalent to a time harmonic oscillator moving along an axis of distance $2r_n$ in the direction of $\hat{r}$. No radiation is possible. This result is also analogous to the case of a nonradiative harmonically expanding and contracting sphere as given by Abbott and Griffiths [19], Schott [20] and Pearle [21-22]. Nonradiative energy transfer is also forbidden since this requires conservation of angular momentum of the electron and the photon standing wave, and also no coupling mechanism exists in this case. Electronic transitions below the $H\left[\dfrac{a_H}{\alpha^{-1}}\right]$ state are not possible since no energy transfer mechanism is possible.

There are many problems with the QM-free electron such as the prediction of infinite angular momentum and infinite rotational energy as well as the prediction that the free electron wave function is sinusoidal over all space and is nonintegrable; thus, it

is nonsensical as discussed previously[106]. In contrast, the CQM-free electron given in

Chp 3 of reference No. 1 identically matches experimentation. Zimmerman is mistaken

in his read of Applicant's theory. In Chp. 3 of reference No. 1 appears:

> In this case, the angular frequency ω_z is given by
>
> $$\omega_z = \frac{\hbar}{m_e \rho_0^2} \quad (3.33)$$
>
> which conserves the electron's angular momentum of $\hbar$ relative to its center of mass as shown by Eq. (1.57). The direction of the angular momentum and the corresponding magnetic moment of μ_B can change orientation with the application of a magnetic field.
>
> The free electron is unpolarized. The center of mass of the electron propagates at the original constant velocity v_z in Eq. (3.2). The magnetic moment corresponding to the angular momentum along the z-axis results in the alignment of the z-axis of the free electron with the magnetic field.

The spin axis is independent of the direction of propagation, as given in Chp 3 of

reference No. 1 and communicated to Zimmerman in Applicant's attached response

posted to the same hydrino study group in Sept. (2001). In an unprofessional manner,

Zimmerman posted his flawed criticism of Applicant's theory despite Applicant pointing

out Zimmerman's mistake in previous posts.

This comes as no surprise given Zimmerman's public statement of his intention

to "stab a knife into the heart of CQM," which is improper behavior for a scientist.

Furthermore, Zimmerman's competence is called into question questionable given his

many outlandish statements and positions posted to this group such as "conservation of

energy as a formal concept is quite modern" [P. Zimmerman post on 5/21/03

(Attachment H)] and his lack of understanding of the basic concepts of Maxwell's

equations [as summarized in R. Mills post on 5/23/03 (Attachment I)].

On page 3 of the present Office Action, the Secret Committee relies on yet

another unreliable, non-peer reviewed article ("internet article by Gottfried") for the

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[106] Reference Nos. 5, 17, and 94.

statement that: "Gottfried implies that quantum electrodynamics has been quite
successful when experimentally investigated, and would appear to corroborate the
statement by Kleppner *et al.*, cited in the attachment to paper no. 25, that quantum
theory `is the most precisely tested and most successful theory in the history of
science'." Such a statement is mere puffery and is certainly no substitute for
experimental evidence. Applicant has pointed out the numerous flaws associated with
Quantum Theory based on experimental evidence and, notably, the Committee can
provide no cogent response other than the unsubstantiated conclusions of self grandeur
found in internet articles.

**Response to the Secret Committee's argument precluding Applicant's invention
since it corresponds to quantum states that are fractional rather than integer**

On pages 4-5 of the Office Action, the Secret Committee argues that only integer
quantum numbers have been observed experimentally. This is not true. The quark
family of particles are observed to have fractional quantized charge. Nuclear spin
quantum numbers can be fractions. Fermions have the fractional spin quantum number
1/2. Fractional quantum numbers are observed for the fractional quantum hall effect.
Of course, fractional quantum numbers are also common for macroscopic systems,
such as waveguides and resonator cavities.

In the case of the Schrödinger solutions of the wave equation, arbitrary constants
are chosen to give the quantum numbers experimentally observed 40 years before the
postulation of the Schrödinger equation having these arbitrary nonphysical solutions.
Since they are not based on physics they are not unique, and other solutions, each
corresponding to any arbitrary constant in the corresponding Laguerre differential
equation, including reciprocal integers, are equally valid as discussed previously.[107]

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[107] R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to
Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10,
(2001), pp. 1059-1096.

Furthermore, it has been shown that the results are plagued with internal

inconsistencies and failure at matching other experimental data such as spin, angular

momentum, rotational energy, scattering, highly excited states, ionization, stability with

respect to radiation, etc. [108].

It is well known that the excited energy states of atomic hydrogen are empirically

given by Rydberg equation (Eq. (1a) for $n > 1$ in Eq. (1b)).

$$E_n = -\frac{e^2}{n^2 8\pi\varepsilon_o a_H} = -\frac{13.598\ eV}{n^2} = -\left(\frac{1}{n}\right)^2 13.598\ eV \tag{1a}$$

$$n = 1,2,3,... \tag{1b}$$

The $n = 1$ state is the "ground" state for "pure" photon transitions (i.e. the $n = 1$

state can absorb a photon and go to an excited electronic state, but it cannot release a

photon and go to a lower-energy electronic state). However, an electron transition from

the ground state to a lower-energy state may be possible by a resonant nonradiative

energy transfer, such as multipole coupling or a resonant collision mechanism.

Processes such as hydrogen molecular bond formation that occur without photons and

that require collisions are common[109]. Also, some commercial phosphors are based on

resonant nonradiative energy transfer involving multipole coupling[110].

R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.

[108] R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Am. J. Phys., submitted.

[109] N. V. Sidgwick, The Chemical Elements and Their Compounds, Volume I, Oxford, Clarendon Press, (1950), p.17.

[110] M. D. Lamb, Luminescence Spectroscopy, Academic Press, London, (1978), p. 68.

According to Applicant's invention, atomic hydrogen may undergo a catalytic reaction with certain atoms and ions such as He^+, which singly or multiply ionize at integer multiples of the potential energy of atomic hydrogen, $m \cdot 27.2 \ eV$, wherein m is an integer. The theory derived from Maxwell's equations was given previously[111]. The reaction involves a nonradiative energy transfer to form a hydrogen atom that is lower in energy than unreacted atomic hydrogen that corresponds to a fractional principal quantum number. That is

$$n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, ..., \frac{1}{p} ; \quad p \text{ is an integer} \qquad (1c)$$

replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. The $n = 1$ state of hydrogen and the $n = \dfrac{1}{\text{integer}}$ states of hydrogen are nonradiative, but a transition between two nonradiative states is possible via a nonradiative energy transfer, say $n = 1$ to $n = 1 / 2$. Thus, a catalyst provides a net positive enthalpy of reaction of $m \cdot 27.2 \ eV$ (i.e. it resonantly accepts the nonradiative energy transfer from hydrogen atoms and releases the energy to the surroundings to affect electronic transitions to fractional quantum energy levels). As a consequence of the nonradiative energy transfer, the hydrogen atom becomes unstable and emits further energy until it achieves a lower-energy nonradiative state having a principal energy level given by Eqs. (1a) and (1c).

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[111] R. L. Mills, "Classical Quantum Mechanics", Physics Essays, submitted.
R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, January 2003 Edition, posted at www.blacklightpower.com.
R. Mills, J. Dong, Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", Int. J. Hydrogen Energy, Vol. 25, (2000), pp. 919-943.
R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322.
R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

Substitution of Eq. (1c) into Eq. (1a) gives

$$E_n = -\frac{e^2}{n^2 8\pi\varepsilon_o a_H} = -\frac{13.598\ eV}{n^2} = -(p)^2 13.598\ eV \quad p \text{ is an integer} \tag{2}$$

Thus, it can clearly be appreciated that Applicant's solutions of the energy levels of the hydrogen atom based on Maxwell's equations do in fact correspond to integer quantum numbers[112]. These same solutions can also be obtained as eigenvalue solutions of the Schrödinger equation as discussed previously[113].

Maxwell's equations are physical laws, whereas the probability wave mechanics of the Schrödinger and Dirac equation can not possibly represent reality as discussed previously[114]. Maxwell's equations have been remarkably successful over a period of time about 100 years longer than quantum mechanics and QED. Applicant has further

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[112] R. L. Mills, "Classical Quantum Mechanics", Physics Essays, submitted.
R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, January 2003 Edition, posted at www.blacklightpower.com.
R. Mills, J. Dong, Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", Int. J. Hydrogen Energy, Vol. 25, (2000), pp. 919-943.
R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322.
R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

[113] R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.

[114] R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Am. J. Phys., submitted.
F. Laloë, Do we really understand quantum mechanics? Strange correlations, paradoxes, and theorems, Am. J. Phys. 69 (6), June 2001, 655-701

shown that they apply to the atomic level as well[115]. This was the goal of the founders

of quantum mechanics, including Dirac, as discussed previously[116].

Applicant's spectroscopic data, which is of the nature upon which scientific

theories are built, shows that quantum mechanic theory in its present form embodied in

the Schrödinger and Dirac equations is incomplete and incorrect. For example, extreme

ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with

2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \, eV$, where

$q = 1,2,3,4,6,7,8,9,11$ or these discrete energies less $21.2 \, eV$ corresponding to inelastic

scattering of these photons by helium atoms due to excitation of $He \, (1s^2)$ to

$He \, (1s^1 2p^1)$.[117] These states matched the predictions from Maxwell's equations given

by Eqs. (1a, 1c) and are missed by the Schrödinger and Dirac equations. Thus, these

theories need to be revised or discarded based on experimental data. Data takes

precedence over theories—not the other way around as incorrectly asserted by the

Secret Committee. The Committee in fact does not challenge the Applicant's

assignment of the real world spectral lines to states given by Eqs. (1a, 1c) that

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[115] R. L. Mills, "Classical Quantum Mechanics", Physics Essays, submitted.
R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, January 2003 Edition, posted at www.blacklightpower.com.
R. Mills, J. Dong, Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", Int. J. Hydrogen Energy, Vol. 25, (2000), pp. 919-943.
R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322.
R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

[116] R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Am. J. Phys., submitted.

[117] R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Am. J. Phys., submitted.

correspond to states below the n=1 state. Nor does it offer any other explanation of the overwhelming amount of data presented by the Applicant. Studies given previously[118] that experimentally confirm a novel reaction of atomic hydrogen that produces hydrogen in fractional quantum states at lower energies than the traditional "ground" ($n = 1$) state, a chemically generated or assisted plasma (rt-plasma), and novel hydride compounds include extreme ultraviolet (EUV) spectroscopy, characteristic emission from catalysis and the hydride ion products, lower-energy hydrogen emission, plasma formation, Balmer α line broadening, population inversion of hydrogen lines, elevated electron temperature, anomalous plasma afterglow duration, power generation, excessive light emission, and analysis of chemical compounds.

On pages 4-5 of the Office Action, the Committee miscalculates the energy levels since it does not take into account the energy being transferred to the catalyst in an amount of m x 27 eV. If the catalyst enthalpy is considered, the Committee will arrive at the correct equation in which spectral lines will have a relationship of q x 13.6 eV. The assignments for the lines and correct calculations is provided in Table 1 of reference No. 28 and Table 1 of reference No. 33. See also Table 1 on page 6 of the present application which lists the calculated energy levels (binding energy) and wavelength for each level of n=1/2 to n=1/16. These equations are very basic to the understanding of Applicant's invention and have been recited in his applications for over 10 years now.

The Committee's argument on page 5 of the Office Action that "applicant has asserted that the transition from the ground state to lower energy states is a *non-radiative* energy transfer, but then argues that these transitions are evidenced by the spectra of radiation" casts further doubt on the Committee's grasp of fundamental scientific principles. Applicant has already addressed this issue many times. Once again, the catalyst reaction involves a nonradiative, resonant energy transfer of $m \cdot 27.2\ eV$ to a catalyst and the remaining energy between the initial and final states is

[118] Lower-Energy Hydrogen Experimental Data, summary of experimental data and corresponding journal article references submitted to the USPTO.

released as a photon or transferred to a third body such as H to form fast H. The photon release can be measured by spectral lines as discussed fully above.

The Committee further argues on page 5 of the Office Action that "[i]t is also noted that as p continues to increase, the radius of the electron orbital decreases by smaller amounts, but the energy released by each successive transition is greater, which would lead toward infinitely larger energy being produced from infinitely smaller spaces, ending only at the size of the hydrogen nucleus." This simply is not true, as discussed previously in response to the Committee's arguments that the electron spirals down to the nucleus. As shown in Applicant's equations 7a and 7b, p stops at 137, which means that no more than 137^2 x 13.6 eV = 2.5 x 10^5 eV can be removed from the hydrogen atom. Nowhere does Applicant suggest that the electron can transition all the way to the nucleus.

Response to the Secret Committee's argument regarding quantum mechanics being the "most successful theory in the history of science"

This is simply not true. If adherence to first principles laws are considered, it has never solved a single problem correctly. In addition such statements are incredulous as shown in Applicant's paper [R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Am. J. Phys., submitted] and Appendix II of the Applicant's book, which follows [R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; September 2002 version posted at www.blacklightpower.com] (bold added for emphasis):

QUANTUM ELECTRODYNAMICS (QED) IS PURELY MATHEMATICAL AND HAS NO BASIS IN REALITY

The spin of the electron and the Lamb shift are calculated from first principles in closed form by Mills as shown in the Electron g Factor section and the Resonant Line Shape and Lamb Shift section, respectively. The spin angular momentum results from the motion of negatively charged mass moving systematically, and the equation for angular momentum, $\mathbf{r} \times \mathbf{p}$, can be applied directly to the wave function (a current density function) that describes the electron. The Lamb shift results from conservation of linear momentum of the photon. The Casimir effect is predicted by Maxwell's equations. These results demonstrate that QED has no basis in reality.

Quantum mechanics failed to predict the results of the Stern-Gerlach experiment, which indicated the need for an additional quantum number. Quantum electrodynamics was proposed by Dirac in 1926 to provide a generalization of quantum mechanics for high energies in conformity with the theory of special relativity and to provide a consistent treatment of the interaction of matter with radiation. It relies on the unfounded notions of negative energy states of the vacuum, virtual particles, and gamma factors. From Weisskopf[119], "Dirac's quantum electrodynamics gave a more consistent derivation of the results of the correspondence principle, but it also brought about a number of new and serious difficulties." Quantum electrodynamics 1.) does not explain nonradiation of bound electrons; 2.) contains an internal inconsistency with special relativity regarding the classical electron radius—the electron mass corresponding to its electric energy is infinite; 3.) it admits solutions of negative rest mass and negative kinetic energy; 4.) the interaction of the electron with the predicted zero-point field fluctuations leads to infinite kinetic energy and infinite electron mass; and 5.) Dirac used the unacceptable states of negative mass for the description of the vacuum, yet, infinities still arise. In 1947, contrary to Dirac's predictions, Lamb discovered a 1000 MHz shift between the $^2S_{1/2}$ state and the $^2P_{1/2}$ state of the hydrogen

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[119] V. F. Weisskopf, Reviews of Modern Physics, Vol. 21, No. 2, (1949), pp. 305-315.

atom[120]. This so called Lamb Shift marked the beginning of modern quantum electrodynamics. In the words of Dirac[121], "No progress was made for 20 years. Then a development came initiated by Lamb's discovery and explanation of the Lamb Shift, which fundamentally changed the character of theoretical physics. It involved setting up rules for discarding ...infinities..." Renormalization is presently believed to be required of any fundamental theory of physics[122]. However, dissatisfaction with renormalization has been expressed at various times by many physicists, including Dirac, who felt that, "This is just not sensible mathematics. Sensible mathematics involves neglecting a quantity when it turns out to be small—not neglecting it just because it is infinitely great and you do not want it!" [123]

Throughout the history of quantum theory, wherever there was an advance to a new application, it was necessary to repeat a trial-and-error experimentation to find which method of calculation gave the right answers. Often the textbooks present only the successful procedure as if it followed from first principles and do not mention the actual method by which it was found. In electromagnetic theory based on Maxwell's equations, one deduces the computational algorithm from the general principles. In quantum theory, the logic is just the opposite. One chooses the principle to fit the empirically successful algorithm. For example, we know that it required a great deal of art and tact over decades of effort to get correct predictions out of QED. The QED method of the determination of $(g-2)/2$ from the *postulated* Dirac equation is based on a *postulated* powers series of α/π where each *postulated* virtual particle is a source of *postulated* vacuum polarization that gives rise to a *postulated* term which is processed

[120] W. E. Lamb, R. C. Retherford, "Fine Structure of the Hydrogen Atom by a Microwave Method", R. C., Phys. Rev., Vol. 72, No. 3, August 1, (1947), pp. 241-243.

[121] P. A. M. Dirac, From a Life of Physics, ed. A. Salam, et al., World Scientific, Singapore, (1989).

[122] P. W. Milonni, The Quantum Vacuum, Academic Press, Inc., Boston, p. 90.

[123] P. A. M. Dirac, Directions in Physics, ed. H. Hora and J. R. Shepanski, Wiley, New York, (1978), p. 36.

over decades using ad hoc rules to remove infinities from each term that arises from *postulated* scores of *postulated* Feynman diagrams. Mohr and Taylor reference some of the Herculean efforts to arrive at g using QED[124]:

> the sixth-order coefficient $A_1^{(6)}$ arises from 72 diagrams and is also known analytically after nearly 30 years of effort by many researchers [see Roskies, Remiddi, and Levine (1990) for a review of the early work]. It was not until 1996 that the last remaining distinct diagrams were calculated analytically, thereby completing the theoretical expression for $A_1^{(6)}$.

For the right experimental numbers to emerge, one must do the calculation (i.e. subtract off the infinities) in one particular way and not in some other way that appears in principle equally valid. For example, Milonni[125] presents a QED derivation of the magnetic moment of the electron, which gives a result of the wrong sign and requires the introduction of an "upper limit K in the integration over $k = \omega/c$ in order to avoid a divergence."

A differential mass is arbitrarily added, then:

> the choice $K = 0.42mc/\hbar$ yields $(g-2)/2 = \alpha/2\pi$ which is the relativistic QED result to first order in α. [...] However, the reader is warned not to take these calculations too seriously, for the result $(g-2)/2 = \alpha/2\pi$ could be obtained by retaining only the first (radiation reaction) term in (3.112) and choosing $K = 3mc/8\hbar$. It should also be noted that the solution $K \cong 0.42mc/\hbar$ of (3.112) with $(g-2)/2 = \alpha/2\pi$ is not unique.

This ad hoc, nonphysical approach of QED leads to incredulous broad sweeping statements by quantum theorists, such as " QED is the best theory we have!" [126] and "[t]he

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[124] P. J. Mohr and B. N. Taylor, "CODATA recommended values of the fundamental physical constants: 1998", Reviews of Modern Physics, Vol. 72, No. 2, April, (2000), p. 474.

[125] P. W. Milonni, The Quantum Vacuum An Introduction to Quantum Electrodynamics, Academic Press, Inc. Boston, pp. 107-111.

[126] P. W. Milonni, The Quantum Vacuum An Introduction to Quantum Electrodynamics, Academic Press, Inc. Boston, p. 108.

history of quantum electrodynamics (QED) has been one of unblemished triumph"[127], which the Secret Committee then improperly relies upon to dismiss Applicant's experimental evidence. As aptly noted by Kallen: from an inconsistent theory, any result may be derived, which accurately describes the ad hoc, nonphysical approach of QED.

The QED determination of the postulated power series in α/π is based on scores of Feynman diagrams corresponding to thousands of matrices with thousands of integrations per matrix requiring decades to reach a consensus on the "appropriate" algorithm to remove the intrinsic infinities. Remarkably, $(g-2)/2$ may be derived in closed form from Maxwell's equations in a simple straightforward manner that yields a result with eleven figure agreement with experiment—the limit of experimental capability. Rather than an infinity of radically different QED models, an essential feature is that *Maxwellian solutions are unique*. The derivation from first principles without invoking virtual particles, zero point fluctuations of the vacuum, and negative energy states of the vacuum is given in the Electron g Factor section.

Furthermore, Oskar Klein pointed out a glaring paradox implied by the Dirac equation which was never resolved[128]. "Electrons may penetrate an electrostatic barrier even when their kinetic energy, $E-mc^2$ is lower than the barrier. Since in Klein's example the barrier was infinitely broad this could not be associated with wave mechanical tunnel effect. It is truly a paradox: Electrons too slow to surpass the potential, may still only be partially reflected. ...Even for an infinitely high barrier, i.e. $r_2 = 1$ and energies $\approx 1\,MeV$, (the reflection coefficient) R is less than 75%! From (2) and (3) it appears that as soon as the barrier is sufficiently high: $V > 2mc^2$, electrons

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[127] G. P. Lepage, "Theoretical advances in quantum electrodynamics, International Conference on Atomic Physics, Atomic Physics; Proceedings, Singapore, World Scientific, Vol. 7, (1981), pp. 297-311.

[128] H. Wergeland, "The Klein Paradox Revisited", Old and New Questions in Physics, Cosmology, Philosophy, and Theoretical Biology, A. van der Merwe, Editor, Plenum Press, New York, (1983), pp. 503-515.

may transgress the repulsive wall-seemingly defying conservation of energy. ...Nor is it possible by way of the positive energy spectrum of the free electron to achieve complete Einstein causality."

The Rutherford experiment demonstrated that even atoms are comprised of essentially empty space[129]. Zero-point field fluctuations, virtual particles, and states of negative energy and mass invoked to describe the vacuum are nonsensical and have no basis in reality since they have never been observed experimentally and would correspond to an essentially infinite cosmological constant throughout the entire universe including regions of no mass. As given by Waldrop[130], "What makes this problem into something more than metaphysics is that the cosmological constant is observationally zero to a very high degree of accuracy. And yet, ordinary quantum field theory predicts that it ought to be enormous, about 120 orders of magnitude larger than the best observational limit. Moreover, this prediction is almost inescapable because it is a straightforward application of the uncertainty principle, which in this case states that every quantum field contains a certain, irreducible amount of energy even in empty space. Electrons, photons, quarks—the quantum field of every particle contributes. And that energy is exactly equivalent to the kind of pressure described by the cosmological constant. The cosmological constant has accordingly been an embarrassment and a frustration to every physicist who has ever grappled with it."

Furthermore, a consequence of the Heisenberg Uncertainty principle and QED is that matter may be created from nothing, including vacuum. Taking quantum theory into account, Stephen Hawking[131] mathematically proved that blackholes must emit Hawking radiation comprising photons, neutrinos, and all sorts of massive particles.

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[129] Beiser, A., Concepts of Modern Physics, Fourth Edition, McGraw-Hill Book Company, New York, (1978), pp. 119-122.

[130] M. M. Waldrop, Science, Vol. 242, December, 2, (1988), pp. 1248-1250

[131] S. W. Hawking, "Particle creation by black holes", Commun. Math Phys., Vol. 43, (1975), pp. 199-220. S. W. Hawking, Phys. Rev. D, Vol. 14, (1976), pp. 2460-2473.

"The surface emits with equal probability all configurations of particles compatible with the observers limited knowledge. It is shown that the ignorance principle holds for quantum-mechanical evaporation of blackholes: The black hole creates particles in pairs, with one particle always falling into the hole and the other possibly escaping to infinity."[132] This QM theorem represents a perpetual motion machine with regard to spontaneous creation of mass and energy from the vacuum and with regard to gravitation. (QM also predicts a perpetual motion machine of the second kind[133]). Contrary to prediction, Hawking radiation has never been observed[134]. Classical laws including conservation of matter-energy are confirmed and QM is invalidated.

The Casimir effect is often touted as proof of that the vacuum is teaming with infinities of virtual particles. The experiment comprises a feeble force between to plates with precision machined surfaces that are brought within microns of contacting each other. The QED explanation of the weak force that is observed between the two plates is that the plates serve to limit the number of virtual particle modes between the plates as opposed to those outside the plates and the resulting imbalance in pressure between two infinite quantities gives rise to the feeble force.[135]

The Casimir effect is predicted by Maxwell's equations and is not due to virtual particles. There is no reality to electromagnetic field zero point fluctuations and the implication that the Casimir force is an intrinsic property of space. The attractive force is

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[132] S. W. Hawking, Phys. Rev. D, Vol. 14, (1976), pp. 2460-2473.

[133] P. F. Schewe and B. Stein, Physic News Update, The American Institute of Physics Bulletin of Physics News, Number 494, July 17, (2000). A. Allahverdyan and T. Nieuwenhuizen, Phys. Rev. Lett., Vol. 85, No. 9, August 28, (2000), pp. 1799-1802.

[134] . M. A. Seeds, Foundations of Astronomy, 1st Edition, Brooks/Cole, Pacific Grove, CA, (1980). Sky and Telescope Magazine, Feb. (1978), p. 113.

[135] P. W. Milonni, The Quantum Vacuum An Introduction to Quantum Electrodynamics, Academic Press, Inc. Boston, pp. 54-58.

due only to the interactions of the material bodies themselves. Lifshitz[136] first developed the theory of the attractive force between two plane surfaces made of a material with a general susceptibility. The Lifshitz calculation is developed from considerations of charge and current fluctuations in a material body. These fluctuations serve as a source term for Maxwell's equations, i.e. classical fields, subject to the boundary conditions presented by the body surfaces. In the limiting case of rarefied media, the van der Waals force of interaction between individual atoms is obtained.

Thus, the *postulated* QED theory of $\frac{g}{2}$ is based on the determination of the terms of a *postulated* power series in α / π where each *postulated* virtual particle is a source of *postulated* vacuum polarization that gives rise to a *postulated* term. The algorithm involves scores of *postulated* Feynman diagrams corresponding to thousands of matrices with thousands of integrations per matrix requiring decades to reach a consensus on the "appropriate" *postulated* algorithm to remove the intrinsic infinities. In contrast to the QM and QED cases, the fourth quantum number arises naturally from Maxwell's equations as derived in the Electron g Factor section of Mills.[137] The remarkable agreement between predictions and experiment demonstrates that $\frac{g}{2}$ may be derived in closed form from Maxwell's equations in a simple straightforward manner that yields a result with eleven figure agreement with experiment—the limit of the experimental capability of the measurement of the fundamental constants that determine α.

The Stern-Gerlach experiment implies a magnetic moment of one Bohr magneton and an associated angular momentum quantum number of 1/2. Historically,

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[136] E. M. Lifshitz, "The theory of molecular attractive forces between solids", Soviet Physics, Vol. 2, No. 1, January, (1956), pp. 73-83.
S. K. Lamoreaux, "CF-1: Casimir Force", Am. J. Phys. Vol. 67, No. 10, October, (1999), p. 850-861.

[137] R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, January 2003 Edition, posted at www.blacklightpower.com.

this quantum number is called the spin quantum number, s ($s = \frac{1}{2}$; $m_s = \pm\frac{1}{2}$).

Conservation of angular momentum of the orbitsphere permits a discrete change of its "kinetic angular momentum" ($\mathbf{r} \times m\mathbf{v}$) with respect to the field of $\frac{\hbar}{2}$, and concomitantly the "potential angular momentum" ($\mathbf{r} \times e\mathbf{A}$) must change by $-\frac{\hbar}{2}$. The flux change, ϕ, of the orbitsphere for $r < r_n$ is determined as follows:

$$\Delta\mathbf{L} = \frac{\hbar}{2} - \mathbf{r} \times e\mathbf{A} \tag{I.9}$$

$$= \left[\frac{\hbar}{2} - \frac{e 2\pi r A}{2\pi}\right]\hat{z} \tag{I.10}$$

$$= \left[\frac{\hbar}{2} - \frac{e\phi}{2\pi}\right]\hat{z} \tag{I.11}$$

In order that the change of angular momentum, $\Delta\mathbf{L}$, equals zero, ϕ must be $\Phi_0 = \frac{h}{2e}$, the magnetic flux quantum. Thus, to conserve angular momentum in the presence of an applied magnetic field, the orbitsphere magnetic moment can be parallel or antiparallel to an applied field as observed with the Stern-Gerlach experiment, and the flip between orientations is accompanied by the "capture" of the magnetic flux quantum by the orbitsphere. During the spin-flip transition, power must be conserved. Power flow is governed by the Poynting power theorem,

$$\nabla \bullet (\mathbf{E} \times \mathbf{H}) = -\frac{\partial}{\partial t}\left[\frac{1}{2}\mu_o \mathbf{H} \bullet \mathbf{H}\right] - \frac{\partial}{\partial t}\left[\frac{1}{2}\varepsilon_o \mathbf{E} \bullet \mathbf{E}\right] - \mathbf{J} \bullet \mathbf{E} \tag{I.12}$$

Eq. (I.13) derived in the Electron g Factor section[138] gives the total energy of the flip transition which is the sum of the energy of reorientation of the magnetic moment (1st

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[138] R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, January 2003 Edition, posted at www.blacklightpower.com.

term), the magnetic energy (2nd term), the electric energy (3rd term), and the dissipated energy of a fluxon treading the orbitsphere (4th term), respectively.

$$\Delta E_{mag}^{spin} = 2\left(1 + \frac{\alpha}{2\pi} + \frac{2}{3}\alpha^2\left(\frac{\alpha}{2\pi}\right) - \frac{4}{3}\left(\frac{\alpha}{2\pi}\right)^2\right)\mu_B B \qquad (1.13)$$

$$\Delta E_{mag}^{spin} = g\mu_B B \qquad (1.14)$$

The spin-flip transition can be considered as involving a magnetic moment of g times that of a Bohr magneton. The g factor is redesignated the fluxon g factor as opposed to the anomalous g factor. The calculated value of $\frac{g}{2}$ is 1.001 159 652 137. The experimental value[139] of $\frac{g}{2}$ is 1.001 159 652 188(4).

In the Quantum Electrodynamics is Purely Mathematical and Has No Basis in Reality section of this Response, the Maxwellian result (Eq. (1.13)) based in reality is contrasted with the QED algorithm of invoking virtual particles, zero point fluctuations of the vacuum, and negative energy states of the vacuum. Rather than an infinity of radically different QED models, an essential feature is that *Maxwellian solutions are unique*.

In contrast to Quantum Mechanics, Applicant has correctly used Maxwell's equations to solve the atom and predict the new states of hydrogen. Applicant's use of first principles to solve problems on scales spanning 85 orders of magnitude is unprecedented and can not be matched with Quantum Mechanics (QM). Classical Quantum Mechanics (CQM) solves problems to greater accuracy than QM and further solves problems that remain unsolvable by QM such as the basis of gravity, fundamental particles, and the acceleration of the expansion of the cosmos, all predicted accurately by Applicant's CQM.

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[139] . R. S. Van Dyck, Jr., P. Schwinberg, H. Dehmelt, "New high precision comparison of electron and positron g factors", Phys. Rev. Lett., Vol. 21, (1987), p. 26-29.

As a specific example, problems that are intractable for QM can easily be solved by CQM such as the particle masses given in the Leptons section, the Proton and Neutron section, and the Quarks section of Ref. [1]:

RELATIONS BETWEEN FUNDAMENTAL PARTICLES

The relations between the lepton masses and neutron to electron mass ratio which are independent of the definition of the imaginary time ruler ti including the contribution of the fields due to charge production are given in terms of the dimensionless fine structure constant α only:

$$\frac{m_\mu}{m_e} = \left(\frac{\alpha^{-2}}{2\pi}\right)^{\frac{2}{3}} \frac{\left(1+2\pi\frac{\alpha^2}{2}\right)}{\left(1+\frac{\alpha}{2}\right)} = 206.76828 \qquad (206.76827)$$

$$\frac{m_\tau}{m_\mu} = \left(\frac{\alpha^{-1}}{2}\right)^{\frac{2}{3}} \frac{\left(1+\frac{\alpha}{2}\right)}{\left(1-4\pi\alpha^2\right)} = 16.817 \qquad (16.817)$$

$$\frac{m_\tau}{m_e} = \left(\frac{\alpha^{-3}}{4\pi}\right)^{\frac{2}{3}} \frac{\left(1+2\pi\frac{\alpha^2}{2}\right)}{\left(1-4\pi\alpha^2\right)} = 3477.2 \qquad (3477.3)$$

$$\frac{m_N}{m_e} = \frac{12\pi^2}{1-\alpha}\sqrt{\frac{\sqrt{3}}{\alpha}} \frac{\left(1+2\pi\frac{\alpha^2}{2}\right)}{\left(1-2\pi\frac{\alpha^2}{2}\right)} = 1838.67 \qquad (1838.68)$$

The success of Applicant's theory is summarized in a book review given by Landvogt [G. Landvogt, "The Grand Unified Theory of Classical Quantum Mechanics", International Journal of Hydrogen Energy, Vol. 28, No. 10, (2003), pp. 1155].

Some well-known facts were previously pointed out in detail by Applicant[140] —

QM is postulated, purely mathematical, and can have no basis in realty. It only works

because it tolerates renormalization and fictitious adjustable terms and parameters that

are not physical and lack internal consistency. Considering the requirement of internal

consistency and the adherence to physical laws, QM has never correctly solved a

physical problem. It has many inescapable and intractable problems as documented in

the following articles and references contained therein:

94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an
    Alternative Maxwellian Approach", J. Phys. D, submitted.

80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the
    Hydrogen Atom According to Quantum Mechanics, Foundations of
    Physics, submitted.

58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays,
    submitted.

53. R. Mills, "A Maxwellian Approach to Quantum Mechanics Explains the
    Nature of Free Electrons in Superfluid Helium", Theoretical Chemistry
    Accounts, submitted.

22. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics",
    Global Foundation, Inc. Orbis Scientiae entitled *The Role of Attractive
    and Repulsive Gravitational Forces in Cosmic Acceleration of Particles
    The Origin of the Cosmic Gamma Ray Bursts*, (29th Conference on
    High Energy Physics and Cosmology Since 1964) Dr. Behram N.
    Kursunoglu, Chairman, December 14-17, 2000, Lago Mar Resort, Fort
    Lauderdale, FL, Kluwer Academic/Plenum Publishers, New York, pp.
    243-258.

21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics",
    Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.

17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of
    Quantum Mechanics and a Basis to Review its Foundations and Make

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[140] Reference Nos. 1, 5, 17, 21, 22, 53, 58, 80, and 94.

a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.

5. R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; July 2003 Edition posted at www.blacklightpower.com.

Ironically, Dirac originally attempted to solve the bound electron physically with stability with respect to radiation according to Maxwell's equations with the further constraints that it was relativistically invariant and gave rise to electron spin.[141] He was unsuccessful and resorted to the current mathematical-probability-wave model that has many problems as discussed in Appendix II: Quantum Electrodynamics (QED) is Purely Mathematical and Has No Basis in Reality.[142] From Weisskopf[143], "Dirac's quantum electrodynamics gave a more consistent derivation of the results of the correspondence principle, but it also brought about a number of new and serious difficulties." Quantum electrodynamics; 1.) does **not explain nonradiation of bound electrons**; 2.) contains an internal inconsistency with special relativity regarding the classical electron radius— the electron mass corresponding to its electric energy is infinite; 3.) it admits solutions of negative rest mass and negative kinetic energy; 4.) the interaction of the electron with the predicted zero-point field fluctuations leads to infinite kinetic energy and infinite electron mass; 5.) Dirac used the unacceptable states of negative mass for the description of the vacuum; yet, infinities still arise.

Dirac's postulated relativistic wave equation also leads to the inescapable results that it gives rise to the Klein Paradox and a cosmological constant that is at least 120

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[141] See P. Pearle, Foundations of Physics, "Absence of radiationless motions of relativistically rigid classical electron", Vol. 7, Nos. 11/12, (1977), pp. 931-945.

[142] Reference No. 1.

[143] V. F. Weisskopf, Reviews of Modern Physics, Vol. 21, No. 2, (1949), pp. 305-315.

orders of magnitude larger than the best observational limit as discussed in Chp. 1,

Appendix II of Ref. No. 1 and previously[144].

QM does not provide a basis for a "ground state" of the hydrogen atom beyond

an arbitrary definition as discussed previously:

> 80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the
> Hydrogen Atom According to Quantum Mechanics, Foundations of
> Physics, submitted.

> 1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*,
> September 2001 Edition, BlackLight Power, Inc., Cranbury, New
> Jersey, Distributed by Amazon.com; January 2003 Edition posted at
> www.blacklightpower.com; Chps. 35-37.

In his statement, "quantum theory is the most successful theory in the history of

science", the Secret Committee is referring to the quantum electrodynamics, which is

fatally flawed as pointed out in R. Mills, The Nature of Free Electrons in Superfluid

Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and

Make a Comparison to Classical Theory, Int. J. Hydrogen Energy, Vol. 26, No. 10,

(2001), pp. 1059-1096. Quantum electrodynamics permits perpetual motion of the first

and second kinds and predicts an infinite cosmological constant.

The success of quantum electrodynamics can be attributed to unlimited lack of

rigor and abandonment to adherence to physical laws.

Taking from R. Mills, The Nature of Free Electrons in Superfluid Helium--a Test

of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison

to Classical Theory, Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096:

> Throughout the history of quantum theory; wherever there was an
> advance to a new application, it was necessary to repeat a trial-and -error
> experimentation to find which method of calculation gave the right
> answers. Often the textbooks present only the successful procedure as if
> it followed from first principles; and do not mention the actual method by

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[144] Reference Nos. 5, 17, 21, 33, 53, 58, 80, and 94.

which it was found. In electromagnetic theory based on Maxwell's equations, one deduces the computational algorithm from the general principles. In quantum theory, the logic is just the opposite. One chooses the principle to fit the empirically successful algorithm. For example, we know that it required a great deal of art and tact over decades of effort to get correct predictions out of Quantum Electrodynamics (QED). For the right experimental numbers to emerge, one must do the calculation (i.e. subtract off the infinities) in one particular way and not in some other way that appears in principle equally valid. There is a corollary , noted by Kallen: from an inconsistent theory, any result may be derived. If internally consistency and adherence to physical laws are invoked, quantum mechanic has never successfully solved a physical problem.

Taking from R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, July 2003 Edition Chp 1, where the references are those given in this section:

The *postulated* QED theory of $\frac{g}{2}$ is based on the determination of the terms of a *postulated* power series in α / π where each *postulated* virtual particle is a source of *postulated* vacuum polarization that gives rise to a *postulated* term. The algorithm involves scores of *postulated* Feynman diagrams corresponding to thousands of matrices with thousands of integrations per matrix requiring decades to reach a consensus on the "appropriate" *postulated* algorithm to remove the intrinsic infinities. The remarkable agreement between Eqs. (1.204) and (1.205) demonstrates that $\frac{g}{2}$ may be derived in closed form from Maxwell's equations in a simple straightforward manner that yields a result with eleven figure agreement with experiment—the limit of the experimental capability of the measurement of the fundamental constants that determine α. In Appendix II: Quantum Electrodynamics is Purely Mathematical and Has No Basis in Reality, the Maxwellian result is contrasted with the QED algorithm of invoking virtual particles, zero point fluctuations of the vacuum, and negative energy states of the vacuum. Rather than an infinity of radically different QED models, an essential feature is that *Maxwellian solutions are unique*.

The muon, like the electron, is a lepton with $\hbar$ of angular momentum. The magnetic moment of the muon is given by Eq. (1.136) with the electron mass replaced by the muon mass. It is twice that from the gyromagnetic ratio as given by Eq. (2.36) of the Orbital and Spin Splitting section corresponding to the muon mass. As is the case with the

electron, the magnetic moment of the muon is the sum of the component corresponding to the kinetic angular momentum, $\frac{\hbar}{2}$, and the component corresponding to the vector potential angular momentum, $\frac{\hbar}{2}$, (Eq. (1.132).

The spin-flip transition can be considered as involving a magnetic moment of g times that of a Bohr magneton of the muon. The g factor is equivalent to that of the electron given by Eq. (1.196).

The muon anomalous magnetic moment has been measured in a new experiment at Brookhaven National Laboratory (BNL) [31]. Polarized muons were stored in a superferric ring, and the angular frequency difference ω_a between the spin precession and orbital frequencies was determined by measuring the time distribution of high-energy decay positrons. The dependence of ω_a on the magnetic and electric fields is given by BMT equation which is the relativistic equation of motion for spin in uniform or slowly varying external fields [32]. The dependence on the electric field is eliminated by storing muons with the "magic" $\gamma = 29.3$, which corresponds to a muon momentum $p = 3.09\ GeV/c$. Hence measurement of ω_a and of B determines the anomalous magnetic moment.

The "magic" γ wherein the contribution to the change of the longitudinal polarization by the electric quadrupole focusing fields are eliminated occurs when

$$\frac{g_\mu \beta}{2} - \frac{1}{\beta} = 0 \qquad\qquad (1.206)$$

where g_μ is the muon g factor which is required to be different from the electron g factor in the standard model due to the dependence of the mass dependent interaction of each lepton with vacuum polarizations due to virtual particles. For example, the muon is much heavier than the electron, and so high energy (short distance) effects due to strong and weak interactions are more important here [28]. The BNL Muon (g-2) Collaboration [31] used a "magic" $\gamma = 29.3$ which satisfied Eq. (1.206) identically for $\frac{g_\mu}{2}$; however, their assumption that this condition eliminated the affect of the electrostatic field on ω_a is flawed as shown in Appendix III: Muon g Factor. Internal consistency was achieved during the determination of $\frac{g_\mu}{2}$ using the BMT equation with the flawed assumption

that $\dfrac{g_\mu}{2} \neq \dfrac{g_e}{2}$. The parameter measured by Carey et al. [31] corresponding

to $\dfrac{g_\mu}{2}$ was the sum of a finite electric term as well as a magnetic term.
The calculated result based on the equivalence of the muon and electron
g factors

$$\frac{g_\mu}{2} = 1.001\ 165\ 923 \tag{1.207}$$

is in agreement with the result of Carey et al. [31]:

$$\frac{g_\mu}{2} = 1.001\ 165\ 925\ (15) \tag{1.208}$$

Rather than indicating an expanded plethora of postulated super-
symmetry virtual particles which make contributions such as smuon-
neutralino and sneutrino-chargino loops as suggested by Brown et al. [33],
the deviation of the experimental value of $\dfrac{g_\mu}{2}$ from that of the standard
model prediction simply indicates that the muon g factor is equivalent to
the electron g factor.

Taking from R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, July
2003 Edition Appendix II: Quantum Electrodynamics (QED) is Purely Mathematical and
Has No Basis in Reality where the references are those given in this section:

Throughout the history of quantum theory, wherever there was an
advance to a new application, it was necessary to repeat a trial-and -error
experimentation to find which method of calculation gave the right
answers. Often the textbooks present only the successful procedure as if
it followed from first principles and do not mention the actual method by
which it was found. In electromagnetic theory based on Maxwell's
equations, one deduces the computational algorithm from the general
principles. In quantum theory, the logic is just the opposite. One chooses
the principle to fit the empirically successful algorithm. For example, we
know that it required a great deal of art and tact over decades of effort to
get correct predictions out of QED. The QED method of the determination

of $(g-2)/2$ from the *postulated* Dirac equation is based on a *postulated* power series of α/π where each *postulated* virtual particle is a source of *postulated* vacuum polarization that gives rise to a *postulated* term which is processed over decades using ad hoc rules to remove infinities from each term that arises from *postulated* scores of *postulated* Feynman diagrams. Mohr and Taylor reference some of the Herculean efforts to arrive at g using QED [50]:

"the sixth-order coefficient $A_1^{(6)}$ arises from 72 diagrams and is also known analytically after nearly 30 years of effort by many researchers [see Roskies, Remiddi, and Levine (1990) for a review of the early work]. It was not until 1996 that the last remaining distinct diagrams were calculated analytically, thereby completing the theoretical expression for $A_1^{(6)}$".

For the right experimental numbers to emerge, one must do the calculation (i.e. subtract off the infinities) in one particular way and not in some other way that appears in principle equally valid. For example, Milonni [51] presents a QED derivation of the magnetic moment of the electron which gives a result of the wrong sign and requires the introduction of an

"upper limit K in the integration over $k = \omega/c$ in order to avoid a divergence."

A differential mass is arbitrarily added, then

"the choice $K = 0.42mc/\hbar$ yields $(g-2)/2 = \alpha/2\pi$ which is the relativistic QED result to first order in α. [...] However, the reader is warned not to take these calculations too seriously, for the result $(g-2)/2 = \alpha/2\pi$ could be obtained by retaining only the first (radiation reaction) term in (3.112) and choosing $K = 3mc/8\hbar$. It should also be noted that the solution $K \cong 0.42mc/\hbar$ of (3.112) with $(g-2)/2 = \alpha/2\pi$ is not unique."

Such an ad hoc nonphysical approach makes incredulous:

" the cliché that QED is the best theory we have!" [52]

or the statement that:

"The history of quantum electrodynamics (QED) has been one of unblemished triumph" [53].

There is a corollary, noted by Kallen: from an inconsistent theory, any result may be derived.

The QED determination of the postulated power series in α/π is based on scores of Feynman diagrams corresponding to thousands of matrices with thousands of integrations per matrix requiring decades to reach a consensus on the "appropriate" algorithm to remove the intrinsic infinities. Remarkably, $(g-2)/2$ may be derived in closed form from Maxwell's equations in a simple straightforward manner that yields a result with eleven figure agreement with experiment—the limit of experimental capability. Rather than an infinity of radically different QED models, an essential feature is that *Maxwellian solutions are unique*. The derivation from first principles without invoking virtual particles, zero point fluctuations of the vacuum, and negative energy states of the vacuum is given in the Electron g Factor section.

Furthermore, Oskar Klein pointed out a glaring paradox implied by the Dirac equation which was never resolved [54]. "Electrons may penetrate an electrostatic barrier even when their kinetic energy, $E - mc^2$ is lower than the barrier. Since in Klein's example the barrier was infinitely broad this could not be associated with wave mechanical tunnel effect. It is truly a paradox: Electrons too slow to surpass the potential, may still only be partially reflected. ...Even for an infinitely high barrier, i.e. $r_2 = 1$ and energies $\approx 1\,MeV$, (the reflection coefficient) R is less than 75%! From (2) and (3) it appears that as soon as the barrier is sufficiently high: $V > 2mc^2$, electrons may transgress the repulsive wall—seemingly defying conservation of energy. ...Nor is it possible by way of the positive energy spectrum of the free electron to achieve complete Einstein causality."

The Rutherford experiment demonstrated that even atoms are comprised of essentially empty space [55]. Zero-point field fluctuations, virtual particles, and states of negative energy and mass invoked to describe the vacuum are nonsensical and have no basis in reality since they have never been observed experimentally and would correspond to an essentially infinite cosmological constant throughout the entire universe including regions of no mass. As given by Waldrop [56], "What makes this problem into something more than metaphysics is that the cosmological constant is observationally zero to a very high degree of accuracy. And yet, ordinary quantum field theory predicts that it ought to be enormous, about 120 orders of magnitude larger than the best observational limit. Moreover, this prediction is almost inescapable because it is a

straightforward application of the uncertainty principle, which in this case states that every quantum field contains a certain, irreducible amount of energy even in empty space. Electrons, photons, quarks—the quantum field of every particle contributes. And that energy is exactly equivalent to the kind of pressure described by the cosmological constant. The cosmological constant has accordingly been an embarrassment and a frustration to every physicist who has ever grappled with it."

Furthermore, a consequence of the Heisenberg Uncertainty principle and QED is that matter may be created from nothing, including vacuum. Taking quantum theory into account, Stephen Hawking [57-58] mathematically proved that blackholes must emit Hawking radiation comprising photons, neutrinos, and all sorts of massive particles. "The surface emits with equal probability all configurations of particles compatible with the observers limited knowledge. It is shown that the ignorance principle holds for quantum-mechanical evaporation of blackholes: The black hole creates particles in pairs, with one particle always falling into the hole and the other possibly escaping to infinity [58]." This QM theorem represents a perpetual motion machine with regard to spontaneous creation of mass and energy from the vacuum and with regard to gravitation. (QM also predicts a perpetual motion machine of the second kind [59-60]). Contrary to prediction, Hawking radiation has never been observed [61-63]. Classical laws including conservation of matter-energy are confirmed and QM is invalidated.

QED is further shown to be experimentally incorrect. Mobility measurements and spectroscopy directly show that electrons may be trapped in superfluid helium as autonomous electron bubbles interloped between helium atoms that have been excluded from the space occupied by the bubble. Electrons bubbles in superfluid helium reveal that the electron is real and that a physical interpretation of the wavefunction is necessary. The electron orbitsphere representation matches the data identically and is also in agreement with scattering experiments, another direct determination of the nature of the electron.[145]

Based on the foregoing remarks, the Secret Committee's claim that quantum mechanics is the "most successful theory in the history of science" is incredulous and

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[145] Reference Nos. 1 and 17.

demonstrates a fundamental lack of understanding of the technology underlying

Applicant's invention.

Regarding the Secret Committee's position that the broadening could be attributed to turbulence and to ionization as observed in stars.

Plasma discharges such as RF, microwave, and high voltage glow discharges

have been well characterized over decades. The plasma have been characterized by

models such as coronal, Maxwellian, and Saha-Boltzmann as given in Griem[146]. These

plasmas cells are not stars. The mechanisms for broadening in these cells are

discussed in many articles such as the following:

1. M. Kuraica, N. Konjevic, "Line shapes of atomic hydrogen in a plane-cathode abnormal glow discharge", Physical Review A, Volume 46, No. 7, October (1992), pp. 4429-4432.

2. M. Kuraica, N. Konjevic, M. Platisa and D. Pantelic, *Spectrochimica Acta* Vol. 47, 1173 (1992).

3. I. R. Videnovic, N. Konjevic, M. M. Kuraica, "Spectroscopic investigations of a cathode fall region of the Grimm-type glow discharge", Spectrochimica Acta, Part B, Vol. 51, (1996), pp. 1707-1731.

4. S. Alexiou, E. Leboucher-Dalimier, "Hydrogen Balmer-α in dense plasmas", Phys, Rev. E, Vol. 60, No. 3, (1999), pp. 3436-3438.

5. S. Djurovic, J. R. Roberts, "Hydrogen Balmer alpha line shapes for hydrogen-argon mixtures in a low-pressure rf discharge", J. Appl. Phys., Vol. 74, No. 11, (1993), pp. 6558-6565.

6. S. B. Radovanov, K. Dzierzega, J. R. Roberts, J. K. Olthoff, Time-resolved Balmer-alpha emission from fast hydrogen atoms in low pressure, radio-frequency discharges in hydrogen", Appl. Phys. Lett., Vol. 66, No. 20, (1995), pp. 2637-2639.

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[146]H. R. Griem, "Spectral Line Broadening in Plasmas", Academic Press, NY, 1978.

7. S. B. Radovanov, J. K. Olthoff, R. J. Van Brunt, S. Djurovic, "Ion kinetic-energy distributions and Balmer-alpha (H_α) excitation in $Ar - H_2$ radio-frequency discharges", J. Appl. Phys., Vol. 78, No. 2, (1995), pp. 746-757.

In general, the experimental profile is a convolution of a Doppler profile, an instrumental profile, the natural (lifetime) profile, Stark profiles, van der Waals profiles, a resonance profile, and fine structure. The contribution from each source in resonance transfer (rt)-plasmas of the present Invention was determined to be below the limit of detection as given in the following publications:

37. R. L. Mills, P. Ray, B. Dhandapani, R. M. Mayo, J. He, "Comparison of Excessive Balmer α Line Broadening of Glow Discharge and Microwave Hydrogen Plasmas with Certain Catalysts", J. of Applied Physics, Vol. 92, No. 12, (2002), pp. 7008-7022.

49. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. (2003), pp. 338-355.

43. R. L. Mills, P. Ray, "Substantial Changes in the Characteristics of a Microwave Plasma Due to Combining Argon and Hydrogen", New Journal of Physics, www.njp.org, Vol. 4, (2002), pp. 22.1-22.17.

54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509.

20. R. Mills and M. Nansteel, P. Ray, "Argon-Hydrogen-Strontium Discharge Light Source", IEEE Transactions on Plasma Science, Vol. 30, No. 2, (2002), pp. 639-653.

16. R. Mills, M. Nansteel, and P. Ray, "Excessively Bright Hydrogen-Strontium Plasma Light Source Due to Energy Resonance of Strontium with Hydrogen", J. of Plasma Physics, Vol. 69, (2003), pp. 131-158.

52. R. Mills and M. Nansteel, P. Ray, "Bright Hydrogen-Light Source due to a Resonant Energy Transfer with Strontium and Argon Ions", New Journal of Physics, Vol. 4, (2002), pp. 70.1-70.28.

67. R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542.

33. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

51. R. Mills, P. Ray, R. M. Mayo, "CW H I Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.

The flow rate in Applicant's plasma cell is typically 10 sccm. At these low pressures, the flow is laminar (very low Reynolds number). A upper-limit estimate of the directionally-dependent Doppler broadening due to mass transport can be arrived at by assuming laminar flow at the maximum flow rate of 10 sccm. The cell pressure is about 1 Torr, and the temperature is about 1000 K; thus, the pressure and temperature corrected flow rate is about 25,000 ccm. A very conservative cross section of the plasma cell is 1 cm^2. Thus, the flow velocity is conservatively 4 m/s. This corresponds to a broadening of $\sim 10^{-7}$ eV which is absolutely trivial—even much less than the 0.1 eV corresponding to the neutral gas temperature of 1000 K.

Broadening by high electron density is called Stark broadening. The required electron densities are about six orders of magnitude greater than the measured electron densities in these plasma[147]. Furthermore, only the atomic hydrogen lines (α, β, γ, and δ) were found to be broadened. Stark broadening would result in broadening of

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[147] Reference Nos. 37, 43 and 49.

ALL of the lines, not just the hydrogen lines. From R. L. Mills, P. Ray, E. Dayalan, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. (2003), pp. 338-355:

> From Eq. (5), to get a Stark broadening of only 0.1 nm with $T_e = 9000\ K$, an electron density of about $n_e \sim 3 \times 10^{15}\ cm^{-3}$ is required, compared to that of the argon-hydrogen plasma of $< 10^9\ cm^{-3}$ determined using a compensated Langmuir probe, over six orders of magnitude less. Regional maxima in electron densities that could give rise to Stark broadening was eliminated as a possibility. The measured electron densities did not exceed $10^9\ cm^{-3}$, and the axial variation was weak, showing less than a factor of two change throughout the brightest region of the plasma. The high mass diffusivity of all of the species present made it unlikely that a large density gradient existed anywhere in the plasma at steady state. This result was also evident by the good fit to a Gaussian profile recorded on the argon-hydrogen plasma rather than a Voigt profile as shown in Figure 10. In addition, the line broadening for Balmer β, γ, and δ was comparable to that of Balmer α; whereas, an absence of broadening beyond the instrument width was observed for the lines of argon or helium species such as the 667.73 nm and 591.2 nm Ar I lines and 667.816 nm and 587.56 nm He I lines. Thus, the Stark broadening was also insignificant.

Broadening was observed in glow discharge, RF discharge, and filament cells (rt-plasma) as well as microwave cells. Thus, the broadening is not dependent on the particular plasma source. Only those mixed plasma which contained a catalyst and hydrogen demonstrated broadening. Balmer α line broadening is reported in reference Nos. 16, 20, 30, 33-37, 39, 42-43, 49, 51-52, 54-55, 57, 63-65, 68-69, 71-74, 81-85, 88-89, 91, 92, and 93. Standard broadening mechanisms were considered and eliminated including pressure broadening, resonance broadening, and microwave field broadening. Applicant confirmed that Doppler broadening due to thermal motion was the dominant

source to the extent that other sources may be neglected when each source was considered. In general, the experimental profile is a convolution of two Doppler profiles, an instrumental profile, the natural (lifetime) profile, Stark profiles, van der Waals profiles, a resonance profile, and fine structure. The contribution from each source was determined to be below the limit of detection as shown in:

49. R. L. Mills, P. Ray, E. Dayalan, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. (2003), pp. 338-355.

43. R. L. Mills, P. Ray, "Substantial Changes in the Characteristics of a Microwave Plasma Due to Combining Argon and Hydrogen", New Journal of Physics, www.njp.org, Vol. 4, (2002), pp. 22.1-22.17.

37. R. L. Mills, P. Ray, B. Dhandapani, R. M. Mayo, J. He, "Comparison of Excessive Balmer α Line Broadening of Glow Discharge and Microwave Hydrogen Plasmas with Certain Catalysts", J. of Applied Physics, Vol. 92, No. 12, (2002), pp. 7008-7022.

In addition, only those plasma which contained a catalyst with hydrogen demonstrated other unique features such as the formation of a chemically generated hydrogen plasma (rt-plasma), novel spectral lines corresponding to lower-energy hydrogen states, and inverted hydrogen populations as discussed in:

84. R. L. Mills, P. Ray, J. Dong, M. Nansteel, R. M. Mayo, B. Dhandapani, X. Chen, "Comparison of Balmer α Line Broadening and Power Balances of Helium-Hydrogen Plasma Sources", Plasma Sources Science and Technology, submitted.

74. R. L. Mills, P. C. Ray, R. M. Mayo, M. Nansteel, B. Dhandapani, J. Phillips, "Spectroscopic Study of Unique Line Broadening and Inversion in Low Pressure Microwave Generated Water Plasmas", Physics of Plasmas, submitted.

Additional data confirming the novel claimed reaction of atomic hydrogen to results in extraordinary H energy as measured by the broadening of the Balmer α line are:

16.) the observation by gas chromatography that hydrogen was consumed by the helium-hydrogen plasmas which showed the novel EUV series of lines with energies of $q \cdot 13.6\ eV$, the novel series of spectral lines due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\dfrac{\upsilon*}{3}\right) 0.515902 \cdot eV$, extraordinary H Balmer line broadening corresponding to $180 - 210\ eV$, and excess power of 21.9 W in $3\ cm^3$,[148]

27.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing at wavelengths over a wide range from micron to blue wherein molecular oxygen served as the catalyst as supported by O^{2+} emission and H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone,[149]

28.) the observation of H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone at distances up to 5 cm from the coupler,[150]

44.) the observation that glow discharge plasmas of the catalyst-hydrogen mixtures of strontium-hydrogen, helium-hydrogen, argon-

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[148] Reference No. 37.
[149] Reference Nos. 59, 65-66, 68, 74, 83, and 85.
[150] Reference No. 74.

hydrogen, strontium-helium-hydrogen, and strontium-argon-hydrogen
showed significant Balmer α line broadening corresponding to an average
hydrogen atom temperature of $25 - 45\ eV$; whereas, plasmas of the
noncatalyst-hydrogen mixtures of pure hydrogen, krypton-hydrogen,
xenon-hydrogen, and magnesium-hydrogen showed no excessive
broadening corresponding to an average hydrogen atom temperature of
$\approx 3\ eV$,[151]

    45.) the observation that microwave helium-hydrogen and argon-
hydrogen plasmas having catalyst Ar^+ or He^+ showed extraordinary
Balmer α line broadening due to hydrogen catalysis corresponding to an
average hydrogen atom temperature of $110 - 130\ eV$ and $180 - 210\ eV$,
respectively; whereas, plasmas of pure hydrogen, neon-hydrogen,
krypton-hydrogen, and xenon-hydrogen showed no excessive broadening
corresponding to an average hydrogen atom temperature of $\approx 3\ eV$,[152]

    47.) the observation of significant Balmer α line broadening of
17, 9, 11, 14, *and* 24 eV from rt-plasmas of incandescently heated
hydrogen with K^+ / K^+, Rb^+, cesium, strontium, and strontium with Ar^+
catalysts, respectively, wherein the results could not be explained by Stark
or thermal broadening or electric field acceleration of charged species
since the measured field of the incandescent heater was extremely weak,
1 V/cm, corresponding to a broadening of much less than 1 eV,[153]

In a recent article, Applicant reports for the first time that extraordinary

[151] Reference Nos. 16, 20, 30, 52, and 72.
[152] Reference Nos. 33-37, 43, 49, 60, 63-64, 69, 71, 73-74, 82, 84, 88, 92, and 93.
[153] Reference Nos. 39, 42, 46, 51-52, 54-55, 57, 72, 81, 89, and 91.

broadening of 200 eV is observed in the claimed rt-plasma that is time dependent. This further eliminates known ionization (electron density), turbulence, or field dependent mechanisms as discussed in:

95. R. L. Mills, P. Ray, B. Dhandapani, "Excessive Balmer α Line Broadening of Water-Vapor Capacitively-Coupled RF Discharge Plasmas" IEEE Transactions on Plasma Science, submitted.

The abstract states:

> From the width of the emitted 656.3 nm Balmer α line, it was found that water-vapor capacitively-coupled RF discharge plasmas showed two populations. A typical slow population was observed that was independent of time, and a new phenomenon, an extraordinary fast population that increased from zero to a significant portion of the Balmer α emission with time, was also observed under no-flow conditions. The peak width and energy also increased with time up to a 0.7 nm half-width corresponding to an average hydrogen atom energy of 200 eV. Stark broadening or acceleration of charged species due to high electric fields can not explain the results since the electron density was low, the RF field was constant with time, and only the atomic hydrogen lines were broadened. Rather, an energetic chemical reaction is proposed as the source of the excessive line broadening involving a resonant energy transfer between atomic hydrogen and oxygen where the rate increases with the duration of the discharge.

The data supports the claimed chemical reaction between atomic hydrogen and a catalyst to form lower-energy state hydrogen with the release of energy which is the energy source of the observed extraordinary Doppler broadened hydrogen lines as discussed previously[154] with additional supporting data such as the observation of the spectral lines of lower-energy hydrogen.

Similarly, power is required to maintain a plasma. The formation of lower-energy hydrogen from atomic hydrogen is the power source of chemically generated plasmas

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[154] Reference No. 95.

of the present Invention. Confirming data of rt-plasmas are reported in the following journal articles:

54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509.

20. R. Mills and M. Nansteel, P. Ray, "Argon-Hydrogen-Strontium Discharge Light Source", IEEE Transactions on Plasma Science, Vol. 30, No. 2, (2002), pp. 639-653.

16. R. Mills, M. Nansteel, and P. Ray, "Excessively Bright Hydrogen-Strontium Plasma Light Source Due to Energy Resonance of Strontium with Hydrogen", J. of Plasma Physics, Vol. 69, (2003), pp. 131-158.

52. R. Mills and M. Nansteel, P. Ray, "Bright Hydrogen-Light Source due to a Resonant Energy Transfer with Strontium and Argon Ions", New Journal of Physics, Vol. 4, (2002), pp. 70.1-70.28.

51. R. Mills, P. Ray, R. M. Mayo, "CW H I Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.

47. H. Conrads, R. Mills, Th. Wrubel, "Emission in the Deep Vacuum Ultraviolet from a Plasma Formed by Incandescently Heating Hydrogen Gas with Trace Amounts of Potassium Carbonate", Plasma Sources Science and Technology, Vol. 12, (2003), pp. 389-395.

The Secret Committee should be aware that these discharges are not fully ionized. The ionization fraction of these plasma is very low, typically 10^{-6} .[155] This is

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[155] See M. Kuraica, N. Konjevic, "Line shapes of atomic hydrogen in a plane-cathode abnormal glow discharge", Physical Review A, Volume 46, No. 7, October (1992), pp. 4429-4432; M. Kuraica, N. Konjevic, M. Platisa and D. Pantelic, *Spectrochimica Acta* Vol. 47, 1173 (1992); I. R. Videnovic, N. Konjevic, M. M. Kuraica, "Spectroscopic investigations of a cathode fall region of the Grimm-type glow discharge", Spectrochimica Acta, Part B, Vol. 51, (1996), pp. 1707-1731; S. Alexiou, E. Leboucher-Dalimier, "Hydrogen Balmer-α in dense plasmas", Phys, Rev. E, Vol. 60, No. 3, (1999), pp. 3436-3438; S. Djurovic, J. R. Roberts, "Hydrogen Balmer alpha line shapes for hydrogen-argon mixtures in a low-pressure rf discharge", J. Appl. Phys., Vol. 74, No. 11, (1993), pp. 6558-6565; S. B. Radovanov, K.

also consistent with the measured electron density of $< 10^9 \ cm^{-3}$ [156]compared to the gas

density at 1 Torr and 1000 K of $10^{15} \ cm^{-3}$. Thus, the atomic hydrogen available for the

catalysis reaction is essentially the total.

Regarding the Secret Committee's position that Quantum theory is "the basis for various inventions such as semiconductors, lasers and magnetic resonance imaging"

The Secret Committee cites Tegmark and Wheeler at p. 69:

> The astonishing range of scientific and practical applications of quantum mechanics undergrids: today an estimated 30 percent of the U.S. gross national product is based on inventions made possible by quantum mechanics, from semiconductors in computer chips to lasers in compact-disc players, magnetic resonance imaging in hospitals, and much more.

It is true that technologies have been developed that are based on the

phenomenon of quantization. But, it can not be said that these technologies would not

exist if it were not for probability wave equations (i.e. the Schrodinger equation). This

self grandeur of Wheeler is nonsense. According to Wheeler, not only technologies but

also the existence of the entire universe is dependent on the human mind. In Wheeler's

quantum mechanical view of reality, the existence of a computer, a CD player, or an

MRI scanner relies upon the human mind to collapse the quantum wavefunction to

make these objects real[157]. The Secret Committee is advised to read the original

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Dzierzega, J. R. Roberts, J. K. Olthoff, Time-resolved Balmer-alpha emission from fast hydrogen atoms in low pressure, radio-frequency discharges in hydrogen", Appl. Phys. Lett., Vol. 66, No. 20, (1995), pp. 2637-2639; S. B. Radovanov, J. K. Olthoff, R. J. Van Brunt, S. Djurovic, "Ion kinetic-energy distributions and Balmer-alpha (H_α) excitation in $Ar - H_2$ radio-frequency discharges", J. Appl. Phys., Vol. 78, No. 2, (1995), pp. 746-757, and H. R. Griem, "Spectral Line Broadening in Plasmas", Academic Press, NY, 1978.
[156] Reference Nos. 37 and 43.
[157] See J. Horgan, "Quantum Philosophy", Scientific American, Vol. 276, July, (1992), pp. 94-104.

transistor patent. It will find that it contains NO MENTION OF QUANTUM MECHANICS. It is based purely on empirical material science.

The invention of the transistor was based on phenomenology. The invention of the transistor is covered in Proceedings of the IEEE "Special Issue on the Fiftieth Anniversary of the Transistor", Vol. 86, No. 1, January, (1998). At page 34-36, Shockley's Patent is printed. It is not based on QM. It is an engineering description of an amplifier based on properties of semiconductor materials arranged in a particular fashion.

There is no solution of the Schrodinger equation used in solid state physics. The discipline advances empirically and quantum mechanical hand-waving is added after a discovery. Examples include the quantum and integral Hall effects. Then there is the stifling of technology by QM. For example, theoreticians violently insisted that high temperature superconductivity could not be possible since it violated BCS theory (incidentally a Noble prize was awarded for the DISCOVERY of high temperature superconductivity and the phenomenon can still not be explained by QM theory). The Secret Committee should also note, as stated by Weinstein in Ref. [94], that chemists have been impeded by QM.

Then there is the laser. Stimulated emission started with Einstein as an additional term to empirically fit Planck's blackbody radiator curve. The laser is completely explained by Maxwell's equations using the mere empirical observation of quantized energy levels.

The invention of the laser was based more on classical physics applied to observed quantum phenomenon. The idea of stimulated emission originated in 1917 (ten years before the Schrodinger equation was postulated) when Einstein proposed that Planck's formula for blackbody radiation could be obtained from an ensemble of atoms with quantized energy levels that under went stimulated and as well as

spontaneous emission[158]. This idea was used by Schawlow and Townes[159] in an extension of classical microwave resonator cavity theory to propose the extension of MASER techniques to visible wavelengths. (Masers were originally described classically given the phenomenon of quantization—not by using the Schrodinger equation.)

What is even more devastating to the Secret Committee's argument is that the mere existence of the laser disproves QM and the Heisenberg Uncertainty Principle as pointed out by Carver Meade, Gordon and Betty Moore Professor of Engineering and Applied Science at Caltech, Feynman's former student, colleague and collaborator, as well as Silicon Valley's physicist in residence and leading intellectual, who was recently interviewed on this subject[160]:

> Central to Mead's rescue project are a series of discoveries inconsistent with the prevailing conceptions of quantum mechanics. One was the laser. As late as 1956, Bohr and Von Neumann, the paragons of quantum theory, arrived at the Columbia laboratories of Charles Townes, who was in the process of describing his invention. With the transistor, the laser is one of the most important inventions of the twentieth century. Designed into every CD player and long distance telephone connection, lasers today are manufactured by the billions. At the heart of laser action is perfect alignment of the crests and troughs of myriad waves of light. Their location and momentum must be theoretically knowable. But this violates the holiest canon of Copenhagen theory: Heisenberg Uncertainty. Bohr and Von Neumann proved to be true believers in Heisenberg's rule. Both denied that the laser was possible. When Townes showed them one in operation, they retreated artfully.
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> In Collective Electrodynamics, Mead cites nine other experimental discoveries, from superconductive currents to masers, to Bose-Einstein condensates predicted by Einstein but not demonstrated until 1995.

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[158] See A. Einstein, Phys. Z, Vol. 18, (1917), 121.
[159] See A. L. Schawlow and C. H. Townes, Phys. Rev., (112), (1958), pp. 1940-1949.
[160] See "The Interview Carver Meade", The American Spectator, September/October, (2001), www.gilder.com/AmericanSpectatorArticles/carver.htm.

These discoveries of large-scale, coherent quantum phenomena all occurred after Bohr's triumph over Einstein.

Magnetic resonance is also described by Maxwell's equations. In fact, in a recent communication, Applicant was informed by Dr. Samuel Patz who heads the MRI Laboratory at the Brigham & Women's Hospital, Harvard Medical School's top research center, that MRI is taught at Harvard and Massachusetts Institute of Technology as the classical precession of the bulk magnetization vector in a frame rotating at the Larmor frequency due to the application of an applied RF field at the Larmor frequency wherein the bulk magnetization is due to the phenomenon of nuclear spin direction quantization[161]. The Schrodinger equation is not used, and the quantum theory of the nucleus, quantum chromodynamics (QCD), is an utter failure in that it can not predict the existence of the proton and neutron or correctly account for the phenomenon of nuclear spin, whereas Applicant's theory can. From first principles, Applicant's theory predicts the masses of the proton and neutron and their magnetic moments to within a part per hundred thousand of the observed values in closed form equations containing fundamental constants only[162].

QM has failed. It can not explain the most fundamental observations such as the nature of a photon, the electron, the wave-particles duality nature of light and particles, the masses of particles, gravity, etc.[163] It has been a complete failure at unification[164]. The Secret Committee has gone to great lengths to establish that Noble prizes have been award in the pursuit of QM. The Secret Committee has been diligent at pointing out celebrities of quantum physics. Notably absent from the list are Newton, Einstein, and Maxwell. It doesn't matter how many theoreticians toil at trying to make QM work or

[161] See Patz, S., Cardiovasc Interven Radiol, (1986), 8:25, pp. 225-237.
[162] See R. Mills, The Grand Unified Theory of Classical Quantum Mechanics, July 2003 Edition, Proton and Neutron section.
[163] Reference Nos. 1, 5, 17, 21, 22, 53, 58, 80, and 94.
[164] See Mills, The Grand Unified Theory of Classical Quantum Mechanics, July 2003 Edition, Forward, and Introduction Sections.

what fantasies they will tolerate in order to force it to work if it is based on a *false premise*. That false premise is that physical laws such as Maxwell's equations and Newton's laws with Einstein's special relativity do not apply at the atomic level. Physicists have justified the spookiness and absurd consequences of QM on the basis that no theory based on physical laws can explain quantum phenomena such as quantized nature of light and atomic energy levels and the wave-particle duality. This is absolutely *not true* as shown by Mills[165]. Classical laws work over 85 orders of magnitude of scale from that of elementary particles to that of the cosmos. Science is not a popularity contest, it is the endless search for the ultimate truth of the workings of the physical universe established by empirical observation (I.E. ESTABLISHED BY DIRECT EXPERIMENTATION). Solipsistic nihilism and self grandeur have no place in science.

And, consider the impact on technology. We could live without QM and only accept that empirical result that atomic energy levels are quantized. QM was not even adopted in any serious fashion until well after the seeds were sown for the major technologies cited by the Secret Committee. In contrast, classical laws—Maxwell's equations and Newton's laws—which the Secret Committee argues against by advocating the mutually incompatible QM—are ABSOLUTELY INDISPENSABLE FOR MODERN SOCIETY. They are absolutely predictive, whereas QM is NOT predictive.

And, in contrast to QM, which has never predicted a single technology, Applicant has predicted novel hydrogen chemistry, which is now experimentally confirmed as summarized in the attached document entitled, "Lower-Energy Hydrogen Experimental Data". The match between theoretical predictions and experimental observation are remarkable. The Applicant's predicted technology eclipses the value of those cited by the Secret Committee and could in fact advance them significantly as shown in Applicant's articles:

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[165] R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, July 2003 Edition.

61. R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", Solar Energy Materials & Solar Cells, in press; and

59. R. Mills, P. Ray, R. M. Mayo, "The Potential for a Hydrogen Water-Plasma Laser", Applied Physics Letters, Vol. 82, No. 11, (2003), pp. 1679-1681 and 51. R. Mills, P. Ray, R. M. Mayo, "CW H I Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.

Regarding the Secret Committee's position that faster than light travel is proven

The principle of special relativity of the universal limiting velocity can be made mathematically precise as follows:

For any kind of wave advancing with limiting velocity and capable of transmitting signals, the equation of front propagation is the same as the equation for the front of a light wave.

Thus, the equation

$$\frac{1}{c^2}\left(\frac{\partial \omega}{\partial t}\right)^2 - \left(grad\,\omega\right)^2 = 0$$

acquires a general character; it is more general than Maxwell's equations from which Maxwell originally derived it. As a consequence of the principle of the existence of a universal limiting velocity one can assert the following: the differential equations describing any field that is capable of transmitting signals must be of such a kind that the equation of their characteristics is the same as the equation for the characteristics of light waves.

The alleged tachyons proposed by the Secret Committee violates special relativity. This violation of a fundamental law of nature further disproves quantum theory. The Aspect experiment also further disproves QM and the results can be derived classically as given in Chp 37 of reference No. 1. Furthermore, taking from 17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical

Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096 where the references are those given in this section:

Flawed Interpretation of the Results of the Aspect Experiment--There Is No Spooky Action at a Distance

Bell [121] showed that in a Gedanken experiment of Bohm [122] (a variant of that of EPR) no local hidden-variable theory can reproduce all of the statistical predictions of quantum mechanics. Thus, a paradox arises from Einstein's conviction that quantum-mechanical predictions concerning spatially separated systems are incompatible with his condition for locality unless hidden variables exist. Bell's theorem provides a decisive test of the family of local hidden-variable theories (LHVT). In a classic experiment involving measurement of coincident photons at spatially separated detectors, Aspect [123] showed that local hidden-variable theories are inconsistent with the experimental results. Although Aspect's results are touted as a triumph of the predictions of quantum mechanics, the correct coincidence rate of detection of photons emitted from a doubly excited state of calcium requires that the z component of the angular momentum is conserved on a photon pair basis. As a consequence, a paradox arises between the deterministic conservation of angular momentum and the Heisenberg uncertainty principle. The prediction derived from the quantum nature of the electromagnetic fields for a single photon is inconsistent with Aspect's results, and Bell's theorem also disproves quantum mechanics. Furthermore, the results of Aspect's experiment are predicted by Mills' theory wherein locality and causality hold. Mills derives the predicted coincidence rate based on first principles [124]. The predicted rate identically matches the observed rate.

The Aspect experiment is a test of locality and local hidden variable theories. The Aspect experiment is also a test of quantum mechanics and the HUP. In one design of the experiment, photons are incident to a beam splitter which causes each photon to be split into two that travel along opposite paths to separate detectors. The separate detectors measure the polarization of the arriving photons. By using synchronous detection, photons of a pair may be later compared. The data indicate a random pattern at each detector individually; however, when photons are matched up as pairs, an essentially perfect correlation exists. The quantum mechanical explanation is that before the photon was split its state of polarization was indeterminate. It possessed an infinite number of states in superposition. Then when one element of the pair was detected

information traveled instantaneously (infinitely faster than the speed of light--otherwise known as a spooky action at a distance) to cause the other photon to have a matching polarization. In quantum mechanical terms, the states were entangled, and measurement of one photon caused the other photon's wavefunction to collapse into the matching state.

The correct explanation is that each photon entering the beam splitter originally had a determined state, and angular momentum was conserved on a photon by photon basis at the splitter. Thus, each photon of a pair had a matching polarization before it hit the detector. Locality and cause and effect hold. There is no spooky action at a distance. This experiment actually disproves quantum mechanics. It also disproves local hidden variable theories. The data of the Aspect experiment matches a classical derivation, not a quantum mechanical one.

Everyday observation demonstrates that causality and locality always hold. Bell's theorem postulates that a statistical correlation of A(a) and B(b) is due to information carried by and localized within each photon, and that at some time in the past the photons constituting one pair were in contact and in communication regarding this information. This is the case in many everyday experiences such as transmission, processing, and reception of signals in microelectronics devices. Locality and causality always hold. They hold on the scale of the universe also. But, according to the Big Bang theory of quantum mechanics all photons were at one time in contact; thus, no locality or causality should be observed at all. This is nonsense. The results of the Aspect experiment support the EPR paradox that QM does not describe physical reality. There is a mistake in the derivation of the analysis of the data from Aspect's experiment [125-126].

Bell's theorem is just an inequality relationship between ARBITRARY probability density functions with certain assumptions about independence, expectation value equal to one, etc. wherein an additional probability distribution function is introduced which may represent local hidden variables or something else for that matter. And, the initial functions may correspond to quantum mechanical statistics or something else for that matter. Standard probability rules are accepted such as the probability of two independent events occurring simultaneously is the product of their independent probabilities. What is calculated and plugged into the formula for the functions and whether the substitutions are valid are the issues that determine what Bell's inequality tests when compared with data. Historically, Bell's inequality is a simple proof of statistical inequalities of expectation values of observables given that quantum

statistics is correct and that the physical system possesses "hidden variables". However, if deterministic statistics are actually calculated and quantum statistics is equivalent to deterministic statistics (e.g. detection of a wave at an inefficient detector) but possesses further statistics based on the probability nature of the theory (statistical conservation of photon angular momentum), then Bell's inequality is actually testing determinism versus quantum theory when compared to the data.

Rather than demonstrating that QM does not give us all of the information about the physical world, the data is consistent with the result that QM does not describe the physical world, and that deterministic physics does. A deterministic theory is not required to posses local hidden variables. Maxwell's equations is a deterministic theory. It does not have local hidden variables (LHV). There is no corresponding statistical distribution function. Bell's theorem is a simple proof of statistical inequalities of expectation values of observables given that "QUANTUM" statistics is correct and that the physical system possesses "hidden variables" corresponding to an additional statistical distribution function. What was actually derived to explain the results of the Aspect experiment [123] was a classical calculation of the detection of an extended particle, the polarized photon, at an inefficient detector wherein determinism holds with respect to conservation of angular momentum [125-126]. Thus, the statistics defined as "QUANTUM" was actually deterministic. (The derivation is given by Mills [124]). Furthermore, in actuality, quantum statistics must also possess other statistical distribution functions corresponding to the probability nature of the theory such as a statistical distribution for the z component of angular momentum which is conserved statistically as the number of photons goes to infinity. Thus, the real quantum mechanics statistics corresponds to a local hidden variable theory (LHVT) with respect to the definitions of the arbitrary probability distribution functions in Bell's inequality. Aspect recorded the expectation value of the coincidence rate at separated randomly oriented inefficient polarization analyzers for pairs of photons emitted from a doubly excited state calcium atom. The data showed a violation of Bell's inequality. This proves determinism and the real QM statistics fails the test. Furthermore, the observed coincidence count rate of Aspect [123] is equal to that predicted classically from the statistics of measurement at an inefficient detector only. The additional finite distribution function required in the case of quantum mechanics and QED results in incorrect predictions. There is no spooky action at a distance.

The Aspect experiment shows that momentum in conserved on a photon by photon basis, not statistically as predicted by the HUP. Similar

experiments regarding tests of entanglement predicted by the HUP are
shown to be consistent with first principle predictions and reveal flaws in
the interpretations based on the HUP. The HUP implies nonlocality,
noncausality, and spooky actions at a distance which can be shown to be
experimentally incorrect.

As the above discussions make clear, faster than light travel has not been
proven. In any case, while this debate may be intellectually stimulating, forcing
Applicant to participate in such discussions will not resolve the issues regarding the
patentability of Applicant's claims. That can only be achieved by considering the totality
of Applicant's experimental evidence supporting the operability and enablement of his
lower-energy hydrogen technology.

The Committee's continuing refusal to consider this evidence, which Applicant
submitted to comply with the Committee's own improper patentability standards, is
nothing short of arbitrary and capricious.

**Regarding the Secret Committee's argument that a plasma
precludes the formation of lower-energy hydrogen**

The Secret Committee states on page 2 of the Office Action that:

> Applicant argues that the assertion in the previous office action that
> the formation of lower energy hydrogen is not consistent with the
> formation of a plasma is [sic] "demonstrates a lack of understanding of
> basis scientific principles." When one substance contacts a more
> energetic substance, energy may be transferred from the more energetic
> substance to the less energetic substance, but not vice versa. Put
> another way, when a cool object contacts a warmer object, heat is
> transferred from the warmer to the cooler. This is a basic law of
> thermodynamics. If ordinary hydrogen, with its electrons inhabiting the
> state of $n=1$, were to contact a plasma, in which electrons are energetic
> enough to have been removed from some of their corresponding nuclei,
> energy would be transferred from the (more energetic) electrons of the
> plasma to those of each hydrogen atom. Applicant apparently suggests
> that the less energetic hydrogen electrons would lose energy to the

(already) more energetic electrons present in the plasma. These electrons, from atoms such as argon and strontium (to use applicant's examples), in order to escape from their nuclei, would be much more energetic than the electrons in ordinary hydrogen, because these nuclei are much larger than those of hydrogen, and therefore exhibit a much stronger binding coulomb force to be overcome.

This argument demonstrates such a fundamental lack of understanding of Applicant's invention that it calls into question once again the make up and qualifications of the Secret Committee members charged with examining this application. Furthermore, the Committee's own explanation violates the basic laws of thermodynamics, not Applicant's invention.

In one disclosed example, Applicant introduces only hydrogen and argon into a sealed reaction vessel. Then, to initiate the reaction, heat is added only to dissociate hydrogen into hydrogen atoms and produce a vapor pressure of the catalyst of about 200 mTorr., which is far less energy than that required to produce a plasma. The plasma is produced by the reaction of hydrogen atoms with the argon catalyst, which releases energy from the hydrogen and forms lower-energy hydrogen. This released energy is what fuels the formation of the plasma and is entirely consistent with the basis laws of thermodynamics.

The Secret Committee's failure to understand this process underlying Applicant's invention is truly astonishing. The Committee has it completely backwards in its false assumption that the plasma heats molecular hydrogen and, thereby, takes it to a higher energy level. In failing to recognize the source of energy for the plasma, i.e. the release of energy from dissociated hydrogen atoms that takes them to a lower energy level, the Committee attempts to reconstruct Applicant's invention into a perpetual motion machine in which a plasma supposedly created from nothing heats molecular hydrogen to higher energy states.

More specifically, the Secret Committee fails to understand that the claimed exothermic reaction maintains the rt-plasma in complete accord with the laws of

thermodynamics. The ionization fraction of the rt-plasma, like that of glow discharge plasmas, is low, about 10^{-9} corresponding to an electron density of about $n_e = 2 \, X \, 10^9 \, cm^{-3}$ determined using a Langmuir probe.[166]

The catalysis reaction of argon is

$$27.63 \, eV + Ar^+ + H[a_H] \rightarrow Ar^{2+} + e^- + H\left[\frac{a_H}{2}\right] + 40.8 \, eV \tag{1}$$

$$Ar^{2+} + e^- \rightarrow Ar^+ + 27.63 \, eV \tag{2}$$

And, the overall reaction is

$$H[a_H] \rightarrow H\left[\frac{a_H}{2}\right] + 40.8 \, eV \tag{3}$$
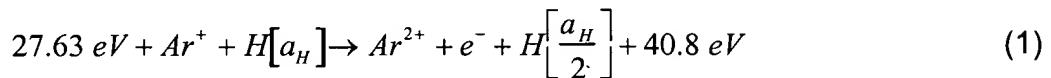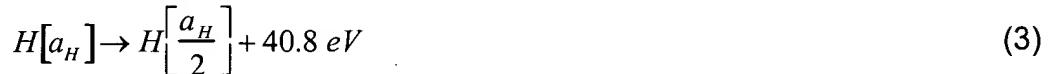
The catalysis reaction of strontium is

$$53.92 \, eV + Sr^+ + H[a_H] \rightarrow Sr^{3+} + 2e^- + H\left[\frac{a_H}{3}\right] + 108.8 \, eV \tag{4}$$

$$Sr^{3+} + 2e^- \rightarrow Sr^+ + 53.92 \, eV \tag{5}$$

And, the overall reaction is

$$H[a_H] \rightarrow H\left[\frac{a_H}{3}\right] + 108.8 \, eV \tag{6}$$
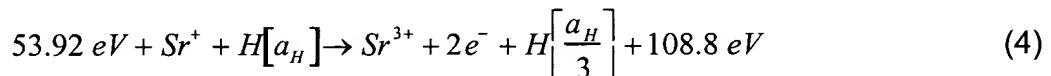
These reaction are exothermic, and the energy released by forming lower-energy atomic hydrogen with energy levels given by

$$E_n = -\frac{e^2}{n^2 8 \pi \varepsilon_o a_H} = -\frac{13.598 \, eV}{n^2} \tag{7a}$$

$$n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots, \frac{1}{p}; \quad p \text{ is an integer; } p \le 137 \tag{7c}$$

is thermalized to maintain the plasma. The characteristic catalyst emission which confirms the reaction given by Eqs. (1-3) and Eqs. (4-6) are is observed. From the

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[166] Reference 54.

document entitled "**Lower-Energy Hydrogen Experimental Data**". Confirmation of that the rt-plasma is maintained by the exothermic hydrogen catalysis reaction is provided by the following extensive experimental evidence:

1.) the observation of intense extreme ultraviolet (EUV) emission at low temperatures (e.g. $\approx 10^3 \, K$) from atomic hydrogen and only those atomized elements or gaseous ions which provide a net enthalpy of reaction of approximately $m \cdot 27.2 \, eV$ via the ionization of t electrons to a continuum energy level where t and m are each an integer (e.g. K and Cs atoms and Rb^+ and Sr^+ ions ionize at integer multiples of the potential energy of atomic hydrogen and caused emission; whereas, the chemically similar atoms, Na, Mg, and Ba, do not ionize at integer multiples of the potential energy of atomic hydrogen and caused no emission),[167]

20.) the observation of continuum state emission of Cs^{2+} and Ar^{2+} at $53.3 \, nm$ and $45.6 \, nm$, respectively, with the absence of the other corresponding Rydberg series of lines from these species which confirmed the resonant nonradiative energy transfer of $27.2 \, eV$ from atomic hydrogen to the either Cs or Ar^+ catalyst,[168]

21.) the spectroscopic observation of the predicted hydride ion $H^-(1/2)$ of hydrogen catalysis by either Cs or Ar^+ catalyst at $407 \, nm$ corresponding to its predicted binding energy of $3.05 \, eV$,[169]

22.) the observation of characteristic emission from K^{3+} which confirmed the resonant nonradiative energy transfer of $3 \cdot 27.2 \, eV$ from atomic hydrogen to atomic K,[170]

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[167] Reference Nos. 11-13, 15-16, 20, 24, 27, 32, 39, 42, 46-47, 51-52, 54-55, 57, 72, 81, 89, and 91-93.
[168] Reference Nos. 24, 39, 51, 54-55, 57, and 91.
[169] Reference No. 24

23.) the spectroscopic observation of the predicted $H^-(1/4)$ ion of hydrogen catalysis by K catalyst at $110\ nm$ corresponding to its predicted binding energy of $11.2\ eV$,[171]

24.) the observation of characteristic emission from Rb^{2+} which confirmed the resonant nonradiative energy transfer of $27.2\ eV$ from atomic hydrogen to Rb^+,[172]

25.) the spectroscopic observation of the predicted $H^-(1/2)$ ion of hydrogen catalysis by Rb^+ catalyst at $407\ nm$ corresponding to its predicted binding energy of $3.05\ eV$,[173]

26.) the observation of $H^-(1/2)$, the hydride ion catalyst product of K^+/K^+ or Rb^+, at its predicted binding energy of $3.0468\ eV$ by high resolution visible spectroscopy as a continuum threshold at 4068.2 Å and a series of structured peaks separated from the binding energy by an integer multiple of the fine structure of $H(1/2)$ starting at 4071 Å that matched predicted free-free transitions,[174]

27.) the observation that the high resolution visible K^+/K^+ or Rb^+-H_2 plasma emission spectra in the region of 3995 to 4060 Å matched the predicted bound-free hyperfine structure lines E_{HF} of $H^-(1/2)$ calculated from the electron g factor as $E_{HF} = j^2 3.00213\ X\ 10^{-5} + 3.0563\ eV$ (j is an integer) for $j=1$ to $j=39$ (3.0563 eV to

[170] Reference Nos. 27, 39, 42, 46, 51, 54-55, 57, 81, 89, and 91.
[171] Reference Nos. 81, 42, and 27.
[172] Reference Nos. 32, 39, 42, 46, 51, 54-55, 57, 81, 89, and 91.
[173] Reference No. 34.
[174] Reference Nos. 39, 42, 46, 57, 81, 89, and 91.

3.1012 eV—the hydride binding energy peak plus one and five times the spin-pairing energy, respectively) to within a 1 part per 10^4 ,[175]

28.) Rb^+ or $2K^+$ catalysts formed a plasma having strong VUV emission with a stationary inverted Lyman population with an overpopulation sufficient for lasing, and emission from $H^-(1/2)$ was observed at 4071 Å corresponding to its predicted binding energy of $3.0468\ eV$ with the fine structure and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213 \times 10^{-5} + 3.0563\ eV$ (j is an integer) that matched for $j = 1$ to $j = 37$ to within a 1 part per 10^4 ,[176]

46.) the observation of the characteristic emission from Sr^+ and Sr^{3+} that confirmed the resonant nonradiative energy transfer of $2 \cdot 27.2\ eV$ from atomic hydrogen to Sr^+,[177]

47.) the observation of anomalous plasmas formed with Sr and Ar^+ catalysts at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source,[178]

52.) the observation of significant Balmer α line broadening of 17, 9, 11, 14, *and* 24 eV from rt-plasmas of incandescently heated hydrogen with K^+/K^+, Rb^+, cesium, strontium, and strontium with Ar^+ catalysts, respectively, wherein the results could not be explained by Stark or thermal broadening or electric field

[175] Reference Nos. 39, 42, 46, 57, 81, 89, and 91.
[176] Reference Nos. 39, 42, 46, 51, 54, 55, 57, 81, 89, and 91.
[177] Reference Nos. 16 and 52.
[178] Reference Nos. 11, 16, 20, 23, 52, and 72.

acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm, corresponding to a broadening of much less than $1\ eV$,[179]

53.) calorimetric measurement of excess power of 20 mW/cc on rt-plasmas formed by heating hydrogen with K^+ / K^+ and Ar^+ as catalysts,[180]

54.) the observation of rt-plasmas formed with strontium and argon at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source as well as an excess power of 20 mW/cm from rt-plasmas formed by Ar^+ as the catalyst in an incandescent-filament cell,[181]

55.) the Calvet calorimetry measurement of an energy balance of over $-151,000\ kJ/mole\ H_2$ with the addition of 3% hydrogen to a plasma of argon having the catalyst Ar^+ compared to the enthalpy of combustion of hydrogen of $-241.8\ kJ/mole\ H_2$; whereas, under identical conditions no change in the Calvet voltage was observed when hydrogen was added to a plasma of noncatalyst xenon,[182]

56.) the observation that the power output exceeded the power supplied to hydrogen glow discharge plasmas by 35-184 W depending on the presence of catalysts from helium or argon and less than 1% partial pressure of strontium metal in noble gas-hydrogen mixtures; whereas, the chemically similar noncatalyst krypton had no effect on the power balance [30],

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[179] Reference Nos. 39, 42, 46, 51-52, 54-55, 57, 72, 81, 89, and 91.
[180] Reference Nos. 39, 81, and 89.
[181] Reference No. 72
[182] Reference No. 31.